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# PESTICIDAL AND NUTRITIONAL PREDISPOSITION OF CREEPING BENTGRASS (*AGROSTIS PALUSTRIS* HUDS.) TO LARGE BROWN PATCH (*RHIZOCTONIA SOLANI* KÜHN)

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ABSTRACT

Influence of selected herbicides and fungicides, under two nitrogen levels (147 kg/ha and 686 kg/ha), on susceptibility of Penncross creeping bentgrass (*Agrostis palustris* Huds.) to the large brown patch disease (*Rhizoctonia solani* Kühn) was investigated. Determinations included pesticide effects on foliage color, stand density, overall quality appearance, and bentgrass susceptibility to other pathogenic fungi.

A significant increase in *R. solani* incidence resulted from individual treatments of DCPA (dimethyl tetrachloroterephthalate) under low N conditions, and benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] under low and high N conditions.

Pesticide combinations resulting in increased *R. solani* incidence were benomyl x bensulide [O,O-diisopropyl phosphorodithioate S-ester with N-(2-mercaptoethyl)benzene-sulfonamide], benomyl x DCPA, benomyl x oxadiazon [2-tert-butyl-4(2,4-dichloro-5-isopropyloxyphenyl)-$\Delta^2$-1,3,4-oxadiazolin-5-one], and triadimefon [1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-yl)-2-butanone] x bensulide, triadimefon x DCPA, and triadimefon x oxadiazon, all under low and high N.

Pesticides implicated in reduction of bentgrass color were chlorothalonil (tetrachloroisophthalonitrile), triadimefon, and oxadiazon under low N, and benomyl, chlorothalonil, triadimefon, and oxadiazon under high N. Pesticide combinations resulting in

loss of bentgrass green color were oxadiazon in combination with each fungicide under low N. Benomyl and chlorothalonil each in combination with all three herbicides, and triadimefon in combination with oxadiazon caused loss of bentgrass green color.

Pesticides reducing bentgrass stand density were bensulide, DCPA, and oxadiazon under high N. Chlorothalonil in combination with bensulide and with oxadiazon reduced bentgrass stand.

Benomyl, DCPA, and oxadiazon treatments under low N resulted in a significant increase in dollar spot. Pesticide combinations involved with increased dollar spot were benomyl x oxadiazon, chlorothalonil x bensulide, chlorothalonil x oxadiazon, and triadimefon in combination with each herbicide. Benomyl and triadimefon, in combination with each herbicide, resulted in increased dollar spot under high N.

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# CHAPTER I

## INTRODUCTION

Pesticides are used to control weeds and other plant parasites and their use increases annually (40). With prospects of continued use of pesticides in turfgrass management and potential adverse effects, there is need to develop a thorough understanding of effects these compounds have on the turfgrass plant.

Pesticides generally cause extensive alterations in morphology and physiology of pest organisms as well as economical plants and beneficial soil microorganisms.

Frequent use of pesticides may influence disease development in turfgrass. Indications are that pesticides may increase susceptibility of turfgrass to pathogenic disease (2, 16, 40). Under specialized conditions certain pesticides can predispose plants to increased disease (3, 14, 37, 42, 50, 61).

Nitrogen, a key element in turfgrass culture, is recognized as having great influence on disease incidence (6, 18). Turfgrasses grown under higher nitrogen fertility levels appear more prone to injury from *Rhizoctonia solani* (Kühn), the incitant of *Rhizoctonia* brown patch (12). Higher nitrogen levels increase succulence of plant tissues and promote leaf exudates (30). Excessive amounts of nitrogen promote development of thinner cell walls which are more easily penetrated by fungal hyphae (6).

*Rhizoctonia* brown patch is one of the most destructive diseases of turfgrass. Large areas of closely cut turfgrass may become blighted rapidly during hot, humid weather with extensive loss of sod.

Objectives of this study were to determine the influence of selected herbicides and fungicides, under two nitrogen levels, on susceptibility of Penncross creeping bentgrass (*Agrostis palustris* Huds.) to the large brown patch disease caused by *Rhizoctonia solani* (Kühn), and any other disease which occurred significantly and uniformly.

## CHAPTER II

## REVIEW OF LITERATURE

There is considerable evidence that fungicides and herbicides significantly affect turfgrass plants. However, there is limited information concerning the effects of interaction between pesticides on plant growth.

Each pesticide used in these investigations will be discussed separately in the following literature review.

### I. FUNGICIDES

Systemic fungicides enter plants to act against pathogens in one of three ways: by inactivating the pathogen in the host, by increasing host resistance to infection, or by interfering with pathogenic processes (43). Once within the plant, systemic compounds encounter a variety of active biochemical systems.

#### Benomyl

Benomyl [methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate] is a broadspectrum, systemic, foliar fungicide labeled for use in turfgrass against many diseases including brown patch (20, 24). Benomyl provides both preventative and curative action and reportedly has good residual activity (59).

Benomyl may be taken up by turfgrass roots and translocated laterally in xylem of stolons to leaves (46). This compound inhibits fungal respiration. In aqueous solution, benomyl gives rise to carbendazim and a second fungitoxic product recognized as butyl isocyanate (43). Both of these compounds interfere with physiological development of the pathogen. Robinson and Hodges (51) report that benomyl is broken down to methyl-2-benzimidazolecarbamate (MBC) in plants. This compound has been shown to increase protein synthesis and to maintain chlorophyll biosynthesis. For these reasons the fate of MBC is of considerable interest.

Benomyl has been shown to alter host plant physiology (37, 51, 64). Benzimidazole derived fungicides are known to have cytokinin-like properties and in many plant species these compounds accentuate the green color of the foliage, retard leaf drop, and delay senescence (37, 64). Warren et al. (64) demonstrated that soil incorporation of benomyl altered root and shoot growth and foliar element accumulation in Penncross creeping bentgrass. Benomyl, applied as a soil treatment, caused an increase in potassium and decreases in phosphorous, calcium, magnesium, manganese, boron, and sodium within plant tissues.

Joyner and Couch (37) observed reductions in overall growth rate of Seaside and Penncross bentgrasses and leaf tip die-back that began as a yellow discoloration and progressed to a light brown color when benomyl was applied at 279 $mg/m^2$. Overall appearance of the bentgrass was mottled and chlorotic.

Robinson and Hodges (51) observed a phytotoxic reaction when benomyl was applied at high concentrations to Arlington bentgrass. They reported increased stolon proliferation and a decrease in dry weight of the bentgrass.

Researchers have reported increased severity of some diseases caused by non-target organisms following use of benzimidazole fungicides (49, 65). Warren et al. (65) found increased occurrence of *Pythium* blight in Penncross bentgrass where benomyl was applied one time to control other organisms. Smith et al. (58) reported that applications of benomyl at concentrations of 0.5 and 1.0 ppm have a predisposing effect on turfgrass to an unidentified basidiomycete.

## Chlorothalonil

Chlorothalonil (tetrachloroisophthalonitrile) is an organic compound used primarily as a foliar fungicide in a preventative capacity, although it has curative activity on certain diseases. *Rhizoctonia* brown patch is included among diseases controlled by this compound. Sanders et al. (54) tested chlorothalonil for in vitro activity against turfgrass pathogens that resemble *R. solani*. Of six fungicides tested, including benomyl, chlorothalonil exhibited greatest overall activity in reducing fungal growth of pathogens. Bell and Muse (7) reported two to four applications of chlorothalonil at 4 ounces/1,000 ft$^2$ (1.2 g/m$^2$) significantly reduced *Helminthosporium* leaf spot and rust diseases on Kentucky bluegrass. Excellent residual properties were reported after final application with no phytotoxicity detected.

Chlorothalonil is believed to work by reaction with thiol groups in the fungal cell (63). Vincent and Sisler (62) suggest the mechanism of fungicidal activity is attributed to thiol inactivation. Meyer and Turgeon (47) reported weekly applications of chlorothalonil at 6 ounces/1,000 $ft^2$ (1.8 $g/m^2$) effectively controlled red leaf spot (caused by Helminthosporium erythrospilum) on Toronto creeping bentgrass. Greatest recovery of diseased bentgrass occurred when fungicides were used in conjunction with early spring fertilization.

No references were found in the literature which indicate chlorothalonil causing direct injury to turfgrass, nor were any citations evident of this compound causing increased pathogen activity.

## Triadimefon

Triadimefon [1-(4-chlorophenoxy)-3,3-dimethyl-1-(1H-1,2,4-triazol-yl)-2-butanone] is a broadspectrum, systemic, foliar fungicide labeled for disease control in turfgrass. Laboratory, field, and greenhouse studies have shown triadimefon to be effective against R. solani (55). Triadimefon provides protection activity. Sanders et al. (55) reported triadimefon as having prolonged residual activity of up to one year in field trials. These researchers hypothesized that residual effect may be due to either residual activity of the chemical in the soil or a reduction in inoculum.

Triadimefon is absorbed by plant roots and translocated both acropetally and basipetally in young growing tissues. The significance of triadimefon as a systemic fungicide lies in its somewhat greater basipetal movement (23). This compound acts as a plant protectant by inhibiting growth of fungal haustoria and therefore preventing completion of the infection process. Gasztonyi and Josepovits (23) reported that triadimefon is converted to triadimenol in fungi and higher plants. Specific activity of this compound against some fungal pathogens is 10 to 20 times that of the parent compound triadimefon.

Some phytotoxicity has been associated with triadimefon, such as plant stunting and foliar discoloration (59). Sanders et al. (55) found a 20 percent reduction in growth of Penncross creeping bentgrass when triadimefon was applied as a soil drench for 4 weeks at 244 g/93 $m^2$.

## II. HERBICIDES

Herbicides successfully control weeds in turfgrass by disrupting one or several key processes. Among physiological processes affected are cell division, cell enlargement, and cellular differentiation. These processes may be altered in such a way that death results or growth is sufficiently inhibited to limit plant competition for water, light, and nutrients (4).

Ashton and Crafts (4), in a discussion of detrimental effects of herbicides on crop plants, state that plants are more susceptible to pathogens even at low population levels in the environment.

Morphological and physiological changes in host plants are caused by herbicides which may alter resistance and susceptibility of the plant to disease (4, 14, 27). These changes in the plant include: modification of wax formation on leaves, changes in host metabolism, and retardation or stimulation of plant growth.

Bensulide

Bensulide [O,O-diisopropyl phosphorodithioate S-ester with N-(2-mercaptoethyl)benzenesulfonamide] is labeled for selective, preemergence control of crabgrass, goosegrass, annual bluegrass and several annual broadleaf plant species in turfgrass. This herbicide also is reported to give long residual weed control (10, 11).

Bensulide is a sulfonamide compound that is adsorbed onto root surfaces with a small amount absorbed into the root system. Little, if any, translocation of the chemical occurs within the root. Bensulide is considered to be a mitotic inhibitor in root tips (63).

Bermudagrass damage with bensulide has been reported. Bingham (8) found that this herbicide reduced initiation of roots on stolons and prevented root elongation. Bermudagrass root tips appeared enlarged and malformed. Callahan (15) reported slight injury to Tifgreen bermudagrass greens after two consecutive applications of bensulide. Injury progressed to a moderate level after the third application. Seagle (56) reported abnormal cell enlargement and reductions in number of roots on Tifgreen bermudagrass when bensulide was applied in solution culture at the equivalent rate of 17 kg/ha. Bermudagrass roots were fewer in number with slightly irregular arrangement of cells.

Reports of bensulide effects in bentgrass are varied. Some investigators reported no injury to bentgrass with bensulide (39, 48). However, other reports revealed that this herbicide has been associated with inhibition of germination and suppression of growth of seedling turfgrass (45). Callahan (13) reported a significant stand reduction with this compound and proposed that bensulide predisposed bentgrass to pathogenic fungi. Karr et al. (40) tested effects of bensulide at 1, 2, and 10 times the labeled recommended rate of 13.44 kg/ha on fungal growth of _R. solani_ at various temperatures. These researchers found fungal growth to be significantly inhibited at 18 C with all bensulide concentrations, and at 35 C by the two highest herbicide concentrations. Significant stimulation of fungal growth occurred at 35 C in potato dextrose agar containing the labeled recommended rate of bensulide.

## DCPA

DCPA (dimethyl tetrachloroterephthalate) is labeled for use in turfgrass as a selective, preemergence herbicide for control of crabgrass, goosegrass, annual bluegrass, and several annual broadleaf weeds. DCPA, a phthalic compound, is absorbed from soil by roots but is not translocated within the plant. Once within the plant, DCPA produces auxin-like growth effects (4). Mazur et al. (45) found no apparent accumulation of DCPA in the soil following four annual applications. Residual activity of this herbicide is reportedly slight (11, 36, 50).

DCPA is generally considered to be a mitotic inhibitor and has been found to cause reduction in root growth. Several investigators have reported direct effects of DCPA on bermudagrass (9, 11, 17). Bingham (9) found that DCPA inhibited root and stolon initiation and prevented elongation of roots in Tifgreen bermudagrass. Histological examination of bermudagrass root tips revealed that cell division had ceased while cell enlargement continued resulting in malformed cells. Callahan (15), in a three year study involving annual applications of DCPA, reported moderate foliage injury to Tifgreen bermudagrass during the first two years. Injury increased to severe damage by the third year. Seagle (56) reported severe injury to Tifgreen bermudagrass when DCPA was applied in solution culture at 17 kg/ha. Extensive root abnormalities and fewer roots were observed.

Several researchers have reported DCPA injury to bentgrass. Roberts and Brockshus (50) reported a reduction in uniformity and a decrease in number of bud counts on C-15, C-27, and C-28 cultivars of creeping bentgrass. These adverse effects resulted in a weakened turfgrass plant with poor recuperative potential. Juska and Hanson (39) reported slight injury to Cohansey bentgrass when DCPA was used at 11 kg/ha. Jagschitz and Skogley (31) reported similar effects in colonial bentgrass. Application of DCPA three consecutive years on a Penncross creeping bentgrass green resulted in slight injury the first year which progressed to moderate sod loss the second and third years (13). During this period, as well as the season following testing, bentgrass was more susceptible to Rhizoctonia brown patch. Seagle (56) reported abnormal cell development and arrangement and a reduction in the number of roots in Penncross creeping bentgrass when DCPA was used at a rate of 17 kg/ha. Seagle also reported abnormally large roots on those plants treated with this herbicide.

DCPA was shown to stimulate growth of soil microorganisms under laboratory conditions (22). A mixed culture of soil algae and fungi increased significantly in presence of DCPA.

## Oxadiazon

Oxadiazon [2-tert-butyl-4(2,4-dichloro-5-isopropyloxyphenyl)-$\Delta^2$-1,3,4-oxadiazolin-5-one] is a oxadiazole compound labeled for selective, preemergence control of crabgrass and other annual weedy grasses and broadleaf weeds in turfgrass. This compound is absorbed by young plants as they come into contact with the herbicide during germination. Oxadiazon is a mitotic inhibitor that tends to cause a reduction in root growth. Moisture is required to activate this compound (59). Oxadiazon is moderately persistent in soil. The label cautions that this herbicide may cause discoloration of some turfgrass species and that bentgrass is not tolerant to oxadiazon.

Johnson (32) reports that growth characteristics of Tifway, Tifgreen, Tifdwarf, Ormond, and Floraturf bermudagrasses were not adversely affected by annual applications of oxadiazon at 3.4 and 4.5 kg/ha over a 4 year period. However, Johnson (35) later reported that oxadiazon at 4.5 and 13.4 kg/ha delayed green-up of Tifgreen, Tifdwarf, and Ormond bermudagrass cultivars. Later Johnson reported that fall applications of oxadiazon at 3.4 kg/ha caused severe red discoloration of bermudagrass within 4 to 6 weeks after treatment. Spring treatment of this herbicide did not visibly injure turfgrass except for a delay in spring green-up. Harper (29) found no serious injury to Tifgreen bermudagrass when oxadiazon was applied in solution culture at the rate of 4.5 kg/ha.

Other studies by Harper (29) using oxadiazon at 4.5 kg/ha in solution culture resulted in wilting and bleached shoot tips of Penncross creeping bentgrass. Oxadiazon also caused abnormal cell development in root tips of the bentgrass. This herbicide has been reported to be unsafe on bermudagrass over-seeded with perennial ryegrass (32, 34). Oxadiazon caused an undesirable discoloration of the ryegrass.

## III. NITROGEN

Nitrogen is essential in good turfgrass culture (6). It promotes good foliage growth, provides a steady rate of growth, aids in development of a deep extensive root system, and is essential in promoting recovery of the plant from injury. Nitrogen is required in larger amounts than other nutrients supplied in turfgrass fertilization. Recuperative potential of turfgrass is enhanced by moderate levels of nitrogen that do not exhaust carbohydrate reserves.

There are many reports in the literature involving the role of nitrogen in disease development. Excessive nitrogen favors development of Rhizoctonia brown patch (6, 12, 19). The amount of nitrogen available for plant use is directly related to carbohydrate utilization (60). Carbohydrates are stored in vegetative cells causing them to thicken. Proteins are formed from manufactured carbohydrates resulting in thinner cell walls when nitrogen levels are in excess. Under high nitrogen conditions, more protoplasm is produced promoting tissue succulence. These conditions allow easier pathogen penetration of host tissue (6, 60).

Some researchers have found that different sources of nitrogen may affect different levels of disease incidence. Davis and Engel (20) found that bentgrass fertilized with activated sewage sludge had lower Rhizoctonia brown patch incidence in comparison to results from a complete fertilizer. Cook et al. (18) reported significant reductions in Sclerotinia dollar spot incidence with activated sewage sludge.

Interrelationships between nitrogen and other pesticides used in turfgrass have been eluded to. Joyner and Couch (37) reported that Penncross and Highland bentgrasses fertilized with Hoagland's solution in which the nitrogen component was adjusted to 0.1 times the normal amount were more susceptible to injury by benomyl than those fertilized at 3.0 times the normal amount of nitrogen at temperatures above 35 C. Jagschitz and Skogley (31) found that damage to Colonial bentgrass resulting from DCPA at 11 kg/ha was less apparent when used in conjunction with monthly applications of nitrogen in the form of ammonium sulphate at 0.5 pounds/1,000 $ft^2$ (2.4 $g/m^2$).

Ammonium nitrate is a widely used nitrogen source for turfgrass. An ammonium salt of nitric acid, this compound contains half of the nitrogen in the nitrate form and half in the ammoniacal form. Total nitrogen content is approximately 33.5 percent. Ammonium nitrate is highly water soluble and gives rapid foliar response. It also has a high foliar burn potential. Ammonium nitrate is slightly acidifying due to nitrification of the ammonium ion.

## IV. *RHIZOCTONIA SOLANI*

*Rhizoctonia* brown patch is one of the most destructive foliar and root rot diseases of turfgrass and is especially injurious to golf green turfgrass (19). The pathogen, *R. solani* (Kühn), spreads within a diseased area by mycelial growth from a central point, producing roughly circular wilted brown areas from several millimeters to a few meters in diameter (53). The margin of an infected area often reveals a characteristic "smoke ring" of grayish-black mycelia where the fungus is actively growing.

Hyphae enter grass leaves through stomata or may penetrate plant surfaces by formation of lobate appressoria (21). Wounds caused by mowing provide other access points for pathogen penetration into the turfgrass plant (53). Once within the grass leaf, *R. solani* produces polygalacturonase, a pectic enzyme which degrades plant tissue causing leaves to shrivel and become brown (5, 57). R. solani is in the form-class Dueteromycetes commonly called 'Fungi Imperfecti' since the fungi which comprise this group apparently lack a sexual phase (1). R. solani is also included in the form-order Agonomycetales often referred to as Mycelia Sterilia since this fungus is not known to produce conidia.

Mycelia of R. solani is white to tan or brown, 4 to 15μ in diameter, and predominantly multinucleate (19). Other identifying characteristics are right angle branching and construction near the septae. Sclerotia are dark brown, membranous, and about 2 mm in diameter.

The pathogen is most damaging at temperatures above 28 C. Dense, highly fertilized, and wet turfgrass is most susceptible to infection by this pathogen (19). Severity of Rhizoctonia brown patch is more pronounced in turfgrass grown under high nitrogen with normal phosphorous and potassium fertilization (12, 38).

## CHAPTER III

## MATERIALS AND METHODS

Investigations were conducted from March to October, 1982, on a Penncross creeping bentgrass research green on the Agricultural campus of the University of Tennessee, Knoxville, Tennessee. The green was constructed similar to specifications recommended by the U.S. Golf Association (26). Composition of the rootzone 30 cm top mix is approximately 84% sand, 3% silt, 1% clay, and 12% peat moss. The sand predominated in the medium fraction range of 0.5 to 0.25 mm diameters. A soil test indicated a pH 6.2 and high phosphorous and potassium content.

Treatments were designed for experimental inducement of stress in bentgrass to aid in determining if selected pesticides can predispose the grass to significant levels of disease incidence. Thus, very high rates of the herbicides and high rates at frequent intervals of the fungicides were used.

### I. TEST AREA

The test consisted of 16 treatments in a complete block design with a split plot arrangement, with four replications. The treatments consisted of herbicides and fungicides applied alone and in all combinations, and an untreated check under low and high N regimes. Duncan's Multiple Range (DMR) test was used to separate treatment means.

Individual plot sizes were 1.2 by 2.1 meters. Only a 0.9 by 2.1 m portion of each plot was treated with herbicide.

## II. HERBICIDE TREATMENTS

The common name, assigned abbreviated names, formulations, and respective rate of application of herbicides used in these studies are presented in Table 1.

All herbicides are classed as preemergence-types and the granular (G) formulations of each were used. Rates are expressed in kilograms of active ingredient per hectare (kg/ha) with corresponding pounds of active ingredient per acre (lb/A). Each herbicide was applied only once, on March 5, 1982, at a high rate. Applications were made with a 3 foot gravity flow spreader calibrated for rate of delivery for the respective rate of each herbicide.

## III. FUNGICIDE TREATMENTS

The common name, assigned abbreviated names, formulations, and respective rate of application of fungicides used in these studies are presented in Table 2.

The wettable powder (WP) formulation was used for each fungicide. Rates for the fungicides are shown in both kilograms of active ingredient per hectare (kg/ha) and ounces of product per 1,000 square feet (oz/$M^2$), as commonly shown on labels.

Benomyl and triadimefon are both systemic and contact fungicides and are labeled for control of Rhizoctonia brown patch. Chlorothalonil

Table 1. Herbicide Common Names, Abbreviations, Formulations, and Treatment Rates Applied March 5, 1982.

| Herbicide Common Name | Abbreviated Name | Formulation | Rate kg/ha | Rate lb/A |
|---|---|---|---|---|
| Bensulide | Bens | 3.6 G | 22.7 | 20 |
| DCPA | DCPA | 2.5 G | 22.7 | 20 |
| Oxadiazon | Oxad | 2.0 G | 9.1 | 8 |

Table 2. Fungicide Common Names, Abbreviations, Formulations, and Treatment Rates Applied March 8 to May 24, 1982.

| Fungicide Common Name | Abbreviated Name | Formulation | Rate kg/ha | Rate $oz/M^2$ |
|---|---|---|---|---|
| Benomyl | Beno | 50 WP | 25 | 8 |
| Chlorothalonil | Chlo | 75 WP | 25 | 8 |
| Triadimefon | Tria | 25 WP | 25 | 8 |

is a contact-type fungicide also labeled for the control of *Rhizoctonia* brown patch. Each fungicide was thoroughly mixed with 3,785 ml of water and applied with a gauged hand-pump compression sprayer at their respective rate. Initial treatments were made on March 8, repeated at 7-day intervals, and terminated on May 24, 1982. A total of 12 fungicide treatments were made.

## IV. NITROGEN AND OTHER FERTILIZER TREATMENTS

Herbicide and fungicide applications were duplicated under very low and very high nitrogen (N) fertilization levels to determine influence of N on pesticidal effects on the turfgrass and disease control. Nitrogen was applied in the form of pelleted ammonium nitrate (33.5 percent nitrogen). Applications were made with a 3-foot gravity flow spreader calibrated for rate of delivery for the respective N rate.

The low N portion of the split plot treatments consisted of 25 kgha per month applied March 5, April 9, May 7, July 9, August 6, and September 30, 1982. Total low N amounts were 147 kg/ha. High N split plot treatments consisted of 98 kg/ha per month. Treatments were at 49 kg/ha on each date with applications made March 5 and 23, April 9 and 23, May 7, and 21, June 4 and 18, July 9 and 23, August 6 and 20, and September 10 and 24, 1982. Total high N amounts were 686 kg/ha.

Phosphate treatments totaled 42 kg/ha and potash totaled 163 kg/ha with applications divided equally between March, April, September, and October.

## V. *RHIZOCTONIA* INOCULATION

Beginning June 14, 1982, each plot was inoculated with *R. solani* obtained from Dr. Houston B. Couch.[1] The pathogen was cultured on potato dextrose agar (PDA) plates. Flasks, 100 ml volume, were half filled with barley seed. Twelve milliliters of distilled water and 0.25 g of calcium carbonate ($CaCO_2$) were placed in each flask to adjust pH favorably for the pathogen and the contents mixed thoroughly. Flasks were plugged with cotton stoppers, covered with aluminum foil, and autoclaved for 20 minutes at 121 C. When cooled, barley seeds were inoculated with mycelial disks taken from the periphery of *R. solani* growing on PDA.[1]

The flasks were incubated for 72 hours before bentgrass field plots were inoculated. During handling in the field, flasks were shaken periodically to facilitate aeration and aid in spread of the pathogen. Barley seed was spread evenly by hand over the plots with approximately 30 seed placed in each plot. Barley seed inoculations were made once per week beginning June 14 with the last made August 30, 1982. Plots were irrigated immediately after each inoculation to aid growth and survival of the pathogen.

## VI. DATA COLLECTION

Test plots were rated weekly beginning April 28 and continuing through September 28, 1982. Characteristics recorded by numerical

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[1]Dr. Houston B. Couch, Professor of Plant Pathology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

rating were: color, quality, and disease susceptibility (Table 3). Other characteristics recorded were percent live stand density. The latter estimates were recorded on a scale of 0 to 100 percent at 5 percent increments.

Table 3. Rating Scale and Characteristics Recorded for Overall Quality Appearance, R. solani Susceptibility, and Foliage Coloration of Bentgrass from April 28 to September 22, 1982.

| Rating Number | | Overall Quality Appearance | | R. solani Resistance | | Foliage Color |
|---|---|---|---|---|---|---|
| 8 | = | Excellent | = | None | = | Dark Green |
| 7 | = | Very Good | = | Very Slight | = | Mottled Dark Green |
| 6 | = | Good | = | Slight | = | Medium Green |
| 5 | = | Medium | = | Fair | = | Light Green |
| 4 | = | Fair | = | Moderate | = | Yellow Green |
| 3 | = | Poor | = | Severe | = | Yellow |
| 2 | = | Very Poor | = | Very Severe | = | Mottled Brown/Green |
| 1 | = | Unacceptable | = | Total Kill | = | Brown |

# CHAPTER IV

## RESULTS AND DISCUSSION

Influence of selected herbicides and fungicides under two N levels on susceptibility of Penncross creeping bentgrass to brown patch and other diseases was investigated. Intentions of this study were to induce bentgrass stress with high rates of selected pesticides to aid in determination of pesticidal predisposition of turfgrass to attack by pathogens. Treatments were made on bentgrass growing on a research green constructed similar to U.S. Golf Association specifications.

Results are presented in accordance with type of bentgrass response determinations made. Determinations recorded were foliage color, disease resistance, stand density, and overall quality appearance. Color generally reflected pesticide phytotoxicity and accented disease activity on the turfgrass. Stand density included percent live bentgrass sod following pesticide treatments and disease activity. Disease susceptibility was measured by the response of the bentgrass to pathogenic activity. Quality rating reflected overall appearance of bentgrass and combines response effects of color, stand density, herbicide effects, and disease activity.

Discussion of pesticide significance effects is based on comparisons with untreated or check plots. Tables shown in Results and Discussion reflect combined means of the seven data collection dates. Appendix tables indicate individual means for each of the seven data collection dates and reflect peak effects for each treatment by date. Table mean values within columns followed by the same letter are not significantly different at the 5 percent level according to Duncan's Multiple Range (DMR) test.

## I. FOLIAGE COLOR RESPONSE

Individual treatments resulting in significant loss of bentgrass foliage color were oxadiazon under low N, and oxadiazon and triadimefon under high N (Table 4). Altered foliar color was attributed to chemical burn of grass leaves rather than fungus activity. Triadimefon induced a blue-green leaf discoloration within 8 weeks after treatments began. However, bentgrass recovery occurred within 2 weeks under low N (Table A-2), and over 14 weeks under high N (Table A-5).

Oxadiazon treated plots exhibited severe red discoloration within 3 weeks after herbicide treatment on March 5 under both N levels. Bentgrass recovered from oxadiazon injury by June 13 under low N (Table A-4), and by May 26 under high N (Table A-3). Bentgrass foliage response to N treatments generally reached its darkest color intensity on May 12 (Table A-2).

Loss of color under low N during late summer appeared attributable to high temperatures rather than pathogen activity (Table A-7). However, under high N, accumulated effects of benomyl resulted in significant loss of color. Bentgrass in all other pesticide treated plots exhibited medium green color.

Table 4. Foliage Color Combined Mean Response of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.4 | a b | Benomyl | 5.1 | a b |
| Chlorothalonil | 3.9 | b | Chlorothalonil | 5.3 | a |
| Triadimefon | 4.9 | a | Triadimefon | 4.5 | c |
| Bensulide | 3.9 | b | Bensulide | 5.6 | a |
| DCPA | 3.8 | b | DCPA | 5.7 | a |
| Oxadiazon | 3.0 | c | Oxadiazon | 4.4 | c |
| Check | 4.3 | a b | Check | 5.6 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Benomyl x oxadiazon and chlorothalonil x oxadiazon treatments resulted in significant loss of color under low N (Table 5). Under high N, significant color loss occurred with chemical combinations of benomyl x oxadiazon, chlorothalonil x oxadiazon, and triadimefon in combination with bensulide, DCPA, and oxadiazon, respectively (Table 5). Bentgrass color loss during spring could be attributed mainly to foliage injury by chlorothalonil, oxadiazon, and triadimefon (Tables A-8 to A-10). Color loss during summer appeared to result from accumulated effects of benomyl (Tables A-13 and A-14).

Bentgrass exhibited much darker color and a faster rate of growth under high N treatments as compared with low N. Foliage injury from pesticide treatments was more obvious under high N than under low N.

## II. RHIZOCTONIA SOLANI PRE-INOCULATION EFFECTS

Brown patch caused by *R. solani* occurred naturally throughout all plots prior to inoculation beginning June 14 and is referred to as background *R. solani*.

Under low N, fair to medium intensities of background *R. solani* occurred extensively by May 12 (Table B-2). Shortly before inoculations began on June 14, background *R. solani* reached significantly higher intensities in plots treated with all three fungicides and with DCPA and oxadiazon (Table B-4). Bentgrass exhibited only slight susceptibility to background *R. solani* under high N even though the disease occurred extensively (Tables B-1 to B-4). Examination

Table 5. Foliage Color Combined Mean Response of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[1] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.0 | a b | Beno x Bens | 5.1 | a b |
| Beno x DCPA | 3.8 | b | Beno x DCPA | 5.1 | a b |
| Beno x Oxad | 2.9 | c | Beno x Oxad | 4.1 | c |
| Chlo x Bens | 3.9 | b | Chlo x Bens | 5.4 | a |
| Chlo x DCPA | 3.9 | b | Chlo x DCPA | 5.4 | a |
| Chlo x Oxad | 2.8 | c | Chlo x Oxad | 4.4 | c |
| Tria x Bens | 4.9 | a | Tria x Bens | 4.7 | b c |
| Tria x DCPA | 4.9 | a | Tria x DCPA | 4.7 | b c |
| Tria x Oxad | 4.3 | a b | Tria x Oxad | 3.6 | c |
| Check | 4.3 | a b | Check | 5.6 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

of data prior to inoculation indicated a significant occurrence of background R. *solani* with individual treatments of chlorothalonil and DCPA under low N, and benomyl under high N (Table 6).

Pesticide interactions resulting in significant occurrences of background R. *solani* involved DCPA in combination with benomyl and with chlorothalonil under low N (Table 7). Triadimefon appeared to counteract potential herbicide phytotoxicity to bentgrass. Triadimefon treated plots exhibited least susceptibility to background R. *solani* (Tables B-5 to B-8).

Bentgrass response to combined pesticide treatments under high N generally indicated little susceptibility to background R. *solani* in comparison to low N (Table 7). In general, there was no significant occurrence of the pathogen above that level which occurred in check plots.

Foliage burn resulting from oxadiazon treatments tended to obscure detection of background R. *solani* (Table B-2). As bentgrass recovered from oxadiazon foliage burn, presence of the pathogen was detected but level of disease incidence was not significant (Table B-4).

## III. *RHIZOCTONIA SOLANI* POST-INOCULATION EFFECTS

Inoculations of R. *solani* began on June 14. Background R. *solani* subsequently decreased (Table B-9), apparently due to increased temperatures (Table 8). It has been reported that under very high air temperatures (above 40 C) parasitic activity of this fungus virtually

Table 6. Rhizoctonia solani Pre-Inoculation Combined Mean Response of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels for April 28 to June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.8 | b | Benomyl | 6.0 | c |
| Chlorothalonil | 4.9 | c | Chlorothalonil | 6.8 | a b |
| Triadimefon | 5.4 | b | Triadimefon | 6.8 | a b |
| Bensulide | 5.5 | b | Bensulide | 6.8 | a b |
| DCPA | 5.2 | c | DCPA | 6.8 | a b |
| Oxadiazon | 7.0 | a | Oxadiazon | 7.3 | a |
| Check | 5.7 | b | Check | 6.8 | a b |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table 7. Rhizoctonia solani Pre-Inoculation Combined Mean Response of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels for April 28 to June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.5 | b | Beno x Bens | 6.8 | a b |
| Beno x DCPA | 5.2 | c | Beno x DCPA | 6.6 | b |
| Beno x Oxad | 6.8 | a | Beno x Oxad | 7.3 | a |
| Chlo x Bens | 6.1 | b | Chlo x Bens | 6.8 | a b |
| Chlo x DCPA | 4.2 | c | Chlo x DCPA | 6.8 | a b |
| Chlo x Oxad | 5.8 | b | Chlo x Oxad | 7.3 | a |
| Tria x Bens | 6.2 | b | Tria x Bens | 6.5 | b |
| Tria x DCPA | 6.2 | b | Tria x DCPA | 6.8 | a b |
| Tria x Oxad | 6.7 | a | Tria x Oxad | 7.3 | a |
| Check | 5.7 | b | Check | 6.8 | a b |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table 8. Daily Minimum and Maximum Temperatures and Total Rainfall at The University of Tennessee, Knoxville, from February 15 to September 30, 1982.

| Date | Temperature °F Min. | Max. | Rainfall Inches | Date | Temperature °F Min. | Max. | Rainfall Inches |
|---|---|---|---|---|---|---|---|
| Feb. 15 | 34 | 57 | ---- | Mar. 25 | 46 | 71 | ---- |
| 16 | 45 | 58 | .72 | 26 | 34 | 71 | ---- |
| 17 | 52 | 57 | .04 | 27 | 28 | 50 | ---- |
| 18 | 51 | 67 | ---- | 28 | 26 | 45 | ---- |
| 19 | 45 | 65 | .05 | 29 | 32 | 54 | ---- |
| 20 | 34 | 56 | ---- | 30 | 40 | 63 | ---- |
| 21 | 43 | 65 | ---- | 31 | 59 | 73 | .34 |
| 22 | 35 | 63 | ---- | | | Total | 5.03 |
| 23 | 31 | 53 | ---- | Apr. 1 | 46 | 74 | .25 |
| 24 | 33 | 74 | ---- | 2 | 46 | 75 | ---- |
| 25 | 35 | 75 | .05 | 3 | 44 | 73 | ---- |
| 26 | 33 | 42 | ---- | 4 | 47 | 74 | ---- |
| 27 | 34 | 42 | .82 | 5 | 48 | 70 | .05 |
| 28 | 41 | 45 | ---- | 6 | 33 | 61 | .01 |
| | | Total | 1.68 | 7 | 26 | 45 | ---- |
| Mar. 1 | 42 | 51 | .03 | 8 | 36 | 49 | .38 |
| 2 | 38 | 57 | ---- | 9 | 40 | 47 | .08 |
| 3 | 35 | 65 | ---- | 10 | 32 | 52 | ---- |
| 4 | 42 | 65 | .01 | 11 | 36 | 60 | ---- |
| 5 | 42 | 69 | .50 | 12 | 44 | 67 | ---- |
| 6 | 38 | 48 | .05 | 13 | 54 | 76 | ---- |
| 7 | 34 | 46 | 1.59 | 14 | 52 | 69 | T |
| 8 | 27 | 39 | .04 | 15 | 53 | 81 | ---- |
| 9 | 34 | 49 | ---- | 16 | 60 | 82 | .10 |
| 10 | 38 | 64 | ---- | 17 | 59 | 80 | .72 |
| 11 | 42 | 67 | ---- | 18 | 42 | 67 | .18 |
| 12 | 50 | 67 | T | 19 | 50 | 67 | ---- |
| 13 | 63 | 78 | T | 20 | 55 | 65 | ---- |
| 14 | 40 | 64 | .28 | 21 | 50 | 75 | .06 |
| 15 | 45 | 53 | .88 | 22 | 46 | 67 | ---- |
| 16 | 48 | 61 | .09 | 23 | 36 | 64 | ---- |
| 17 | 50 | 71 | .29 | 24 | 36 | 67 | ---- |
| 18 | 57 | 77 | .04 | 25 | 47 | 74 | .24 |
| 19 | 55 | 82 | .08 | 26 | 47 | 62 | .76 |
| 20 | 64 | 83 | ---- | 27 | 54 | 75 | .13 |
| 21 | 53 | 79 | .81 | 28 | 47 | 68 | ---- |
| 22 | 38 | 60 | ---- | 29 | 50 | 68 | ---- |
| 23 | 36 | 63 | ---- | 30 | 51 | 72 | ---- |
| 24 | 40 | 64 | ---- | | | Total | 2.96 |

Table 8 (continued)

| Date | Temperature °F Min. | Max. | Rainfall Inches |
|---|---|---|---|
| May 1 | 47 | 73 | ---- |
| 2 | 54 | 77 | ---- |
| 3 | 55 | 76 | ---- |
| 4 | 51 | 78 | ---- |
| 5 | 49 | 82 | ---- |
| 6 | 55 | 84 | ---- |
| 7 | 58 | 84 | ---- |
| 8 | 55 | 76 | .44 |
| 9 | 48 | 75 | ---- |
| 10 | 52 | 79 | ---- |
| 11 | 54 | 82 | ---- |
| 12 | 53 | 84 | ---- |
| 13 | 58 | 88 | ---- |
| 14 | 65 | 87 | ---- |
| 15 | 66 | 89 | ---- |
| 16 | 60 | 89 | 2.17 |
| 17 | 61 | 87 | ---- |
| 18 | 62 | 86 | .30 |
| 19 | 59 | 86 | .50 |
| 20 | 63 | 84 | .37 |
| 21 | 62 | 78 | ---- |
| 22 | 60 | 85 | .35 |
| 23 | 64 | 87 | .85 |
| 24 | 64 | 83 | .02 |
| 25 | 64 | 80 | ---- |
| 26 | 67 | 84 | ---- |
| 27 | 66 | 84 | ---- |
| 28 | 65 | 86 | 1.10 |
| 29 | 63 | 81 | .52 |
| 30 | 67 | 89 | ---- |
| 31 | 72 | 90 | ---- |
| | | Total | 6.62 |
| June 1 | 69 | 89 | .07 |
| 2 | 60 | 82 | ---- |
| 3 | 56 | 84 | ---- |
| 4 | 65 | 79 | .08 |
| 5 | 66 | 77 | .08 |
| 6 | 57 | 77 | ---- |
| 7 | 55 | 80 | ---- |
| 8 | 61 | 84 | ---- |
| 9 | 66 | 87 | ---- |
| June 10 | 72 | 90 | ---- |
| 11 | 64 | 81 | .10 |
| 12 | 61 | 82 | ---- |
| 13 | 65 | 79 | .94 |
| 14 | 59 | 78 | ---- |
| 15 | 63 | 92 | ---- |
| 16 | 63 | 82 | ---- |
| 17 | 61 | 78 | .60 |
| 18 | 67 | 81 | ---- |
| 19 | 64 | 84 | ---- |
| 20 | 62 | 83 | ---- |
| 21 | 60 | 83 | ---- |
| 22 | 65 | 83 | .55 |
| 23 | 64 | 80 | ---- |
| 24 | 62 | 84 | ---- |
| 25 | 63 | 83 | ---- |
| 26 | 67 | 89 | ---- |
| 27 | 68 | 88 | .23 |
| 28 | 68 | 89 | .11 |
| 29 | 70 | 86 | .01 |
| 30 | 68 | 84 | ---- |
| | | Total | 2.77 |
| July 1 | 66 | 89 | ---- |
| 2 | 63 | 86 | ---- |
| 3 | 72 | 88 | ---- |
| 4 | 68 | 92 | .75 |
| 5 | 70 | 91 | ---- |
| 6 | 68 | 89 | ---- |
| 7 | 70 | 89 | ---- |
| 8 | 68 | 89 | .10 |
| 9 | 68 | 90 | 1.87 |
| 10 | 68 | 86 | ---- |
| 11 | 71 | 86 | ---- |
| 12 | 72 | 86 | ---- |
| 13 | 65 | 87 | ---- |
| 14 | 68 | 86 | ---- |
| 15 | 67 | 89 | ---- |
| 16 | 70 | 90 | ---- |
| 17 | 69 | 90 | ---- |
| 18 | 70 | 90 | ---- |
| 19 | 69 | 86 | ---- |

Table 8 (continued)

| Date | Temperature °F Min. | Max. | Rainfall Inches | Date | Temperature °F Min. | Max. | Rainfall Inches |
|---|---|---|---|---|---|---|---|
| July 20 | 70 | 87 | .15 | Aug. 21 | 71 | 89 | ---- |
| 21 | 68 | 90 | ---- | 22 | 60 | 85 | ---- |
| 22 | 68 | 91 | ---- | 23 | 60 | 85 | ---- |
| 23 | 69 | 91 | 1.5 | 24 | 66 | 83 | ---- |
| 24 | 69 | 87 | ---- | 25 | 72 | 81 | ---- |
| 25 | 71 | 91 | .47 | 26 | 59 | 84 | ---- |
| 26 | 75 | 91 | ---- | 27 | 65 | 83 | ---- |
| 27 | 72 | 90 | ---- | 28 | 68 | 84 | ---- |
| 28 | 74 | 93 | ---- | 29 | 61 | 83 | ---- |
| 29 | 70 | 90 | .32 | 30 | 64 | 82 | ---- |
| 30 | 72 | 85 | .78 | 31 | 68 | 76 | ---- |
| 31 | 70 | 87 | 2.00 | | | Total | 6.04 |
| | | Total | 6.59 | Sept. 1 | 72 | 85 | 1.10 |
| Aug. 1 | 68 | 75 | 2.00 | 2 | 70 | 81 | .73 |
| 2 | 64 | 84 | ---- | 3 | 62 | 83 | ---- |
| 3 | 65 | 85 | ---- | 4 | 60 | 79 | ---- |
| 4 | 69 | 86 | ---- | 5 | 58 | 82 | ---- |
| 5 | 74 | 90 | ---- | 6 | 61 | 82 | ---- |
| 6 | 69 | 81 | .05 | 7 | 59 | 82 | ---- |
| 7 | 67 | 89 | ---- | 8 | 59 | 85 | ---- |
| 8 | 70 | 89 | .82 | 9 | 61 | 83 | ---- |
| 9 | 70 | 88 | ---- | 10 | 65 | 84 | ---- |
| 10 | 70 | 81 | 1.26 | 11 | 65 | 79 | T |
| 11 | 70 | 89 | ---- | 12 | 69 | 84 | .01 |
| 12 | 72 | 88 | ---- | 13 | 72 | 78 | ---- |
| 13 | 70 | 89 | ---- | 14 | 70 | 88 | ---- |
| 14 | 70 | 87 | ---- | 15 | 70 | 88 | ---- |
| 15 | 69 | 82 | ---- | 16 | 67 | 88 | ---- |
| 16 | 69 | 83 | ---- | 17 | 64 | 86 | ---- |
| 17 | 70 | 79 | .25 | 18 | 63 | 85 | ---- |
| 18 | 65 | 85 | 1.66 | 19 | 67 | 82 | ---- |
| 19 | 65 | 86 | ---- | 20 | 59 | 74 | T |
| 20 | 69 | 87 | ---- | 21 | 55 | 70 | .05 |

Table 8 (continued)

| Date | Temperature °F Min. | Max. | Rainfall Inches | Date | Temperature °F Min. | Max. | Rainfall Inches |
|---|---|---|---|---|---|---|---|
| Sept. 22 | 49 | 69 | ---- | | | | |
| 23 | 44 | 72 | ---- | | | | |
| 24 | 48 | 68 | .02 | | | | |
| 25 | 54 | 63 | .33 | | | | |
| 26 | 58 | 74 | .44 | | | | |
| 27 | 55 | 73 | ---- | | | | |
| 28 | 50 | 78 | ---- | | | | |
| 29 | 51 | 81 | ---- | | | | |
| 30 | 55 | 80 | ---- | | | | |
| | | Total | 2.68 | | | | |

[1]Source: Climatological Data, Tennessee, National Climatic Center, Asheville, North Carolina, February to September, 1982.

[2]T = Trace Amount.

ceases but readily available soil moisture apparently has little effect on its development (19). Thus, the heavy irrigation provided the research green may have had little influence on R. solani activity. Inoculated R. solani required several weeks to build up sufficient infection intensity in order to detect significant pesticide influences (Table B-9 to B-11).

Under low N, significant incidence of R. solani occurred in plots treated individually with benomyl and DCPA (Table B-11). Under high N, R. solani infections were significant only in benomyl treated plots (Table B-11). Even when post-inoculation means were combined for high N, only benomyl predisposed the bentgrass to significant levels of R. solani (Table 9).

Activity of R. solani appeared greater in individual treatments under high N as compared to low N (Table B-11). This was contrary to that exhibited with occurrence of background R. solani (Tables B-2 to B-4). Tables of pesticide combinations indicated the same opposing effects (Tables B-6 to B-8 and B-12 to B-14). A probable explanation may be attributed to the life cycle of this test grass species. Bentgrass, a cool season turfgrass, grows optimally during lower temperatures of spring (6). Growth rate and disease resistance of bentgrass tend to increase with cooler temperatures and with higher N during spring. Bentgrass experiences stress and increased susceptibility to disease during high temperatures of summer, and high N tends to further increase bentgrass susceptibility. The pre- and post-inoculation R. solani results of spring and fall appear to parallel the life cycle growth characteristics of bentgrass.

Table 9. Rhizoctonia solani Post-Inoculation Combined Mean Response of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels for June 20 to August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.1 | a b | Benomyl | 4.6 | c |
| Chlorothalonil | 5.0 | a b | Chlorothalonil | 5.0 | b |
| Triadimefon | 5.3 | a b | Triadimefon | 5.5 | a b |
| Bensulide | 4.7 | b | Bensulide | 4.7 | b |
| DCPA | 4.8 | b | DCPA | 4.9 | b |
| Oxadiazon | 4.8 | b | Oxadiazon | 4.9 | b |
| Check | 5.0 | b | Check | 5.1 | b |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Results of pesticide combinations under low and high N indicate significant *R. solani* incidence with benomyl in combination with each of the three herbicides, and with chlorothalonil in combination with bensulide and with DCPA (Table B-14). Combined interaction means under high N particularly emphasize a significant predisposition of bentgrass to *R. solani* incidence with chlorothalonil x bensulide (Table 10).

Bentgrass appeared to have recovered from foliage burn caused by oxadiazon with no significant increase in *R. solani* (Tables 9 and 10).

## IV. *SCLEROTINIA HOMOEOCARPA* EFFECTS

Dollar spot occurred naturally and uniformly throughout the test area during late summer and early fall. Disease incidence was recorded during September 1982. Bentgrass was especially susceptible to dollar spot under low N and showed excellent resistance under high N (Table 11).

Combined mean response for individual treatments, under low N, emphasized the significant predisposition effects on bentgrass to dollar spot induced by benomyl, DCPA, and oxadiazon (Table 11). High N counteracted the predisposition effects of all the pesticides on bentgrass, at least through September 8 (Tables C-1 and C-1). Benefits of increased N on reduction of dollar spot have been documented (19). In this study, mid to late September occurrence of dollar spot under high N, corresponds with previous reports that

Table 10. Rhizoctonia solani Post-Inoculation Combined Mean Response of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels for June 20 to August 13, 1982.

| | Low Nitrogen | | | High Nitrogen | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.8 | b | Beno x Bens | 5.2 | b |
| Beno x DCPA | 5.2 | a b | Beno x DCPA | 5,1 | b |
| Beno x Oxad | 5.2 | a b | Beno x Oxad | 5.2 | b |
| Chlo x Bens | 4.9 | b | Chlo x Bens | 4.6 | c |
| Chlo x DCPA | 5.0 | a b | Chlo x DCPA | 5.2 | b |
| Chlo x Oxad | 5.1 | a b | Chlo x Oxad | 5.4 | a b |
| Tria x Bens | 6.1 | a | Tria x Bens | 5.5 | a b |
| Tria x DCPA | 5.7 | a | Tria x DCPA | 5.7 | a |
| Tria x Oxad | 5.8 | a | Tria x Oxad | 5.8 | a |
| Check | 5.0 | b | Check | 5.1 | b |

[1] R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Chemical abbreviations: (See Tables 1 and 2).

[3] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table 11. Sclerotinia homoeocarpa Combined Mean Response of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels for September 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | S. homoeocarpa Rating[1] | | | S. homoeocarpa Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.5 | c | Benomyl | 6.8 | a b |
| Chlorothalonil | 6.5 | a | Chlorothalonil | 7.0 | a |
| Triadimefon | 5.8 | a b | Triadimefon | 6.7 | a b |
| Bensulide | 5.2 | b c | Bensulide | 6.8 | a b |
| DCPA | 4.7 | c | DCPA | 6.6 | a b |
| Oxadiazon | 4.8 | c | Oxadiazon | 6.7 | a b |
| Check | 5.4 | b | Check | 7.2 | a |

[1] *S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

this organism resumes growth and reaches peak activity during mild temperatures of approximately 70-80 F (19). Temperatures in this study during mid to late-September favored peak activity for dollar spot (Table 8). Combined means under low N did not reveal any particular pesticide combinations significantly predisposing bentgrass to dollar spot incidence (Table 12). Results of individual rating dates indicate a significant level of dollar spot occurrence in plots treated with benomyl x oxadiazon, chlorothalonil in combination with bensulide and with oxadiazon, and triadimefon in combination with each of the three herbicides (Tables C-5 and C-6).

Combined means of pesticide combinations under high N exhibited significant predisposition of bentgrass to dollar spot only with triadimefon x oxadiazon (Table 12). No dollar spot was observed on September 1 and 8 (Tables C-5 and C-6). However, under cooler weather conditions of late September, significant levels of dollar spot occurred in plots treated with benomyl in combination with DCPA and with oxadiazon, chlorothalonil x oxadiazon, and triadimefon in combination with each of the three herbicides (Table C-8).

## V. *RHIZOCTONIA CEREALIS* EFFECTS

The only other disease occurring at any significant level in this study was yellow patch, caused by *Rhizoctonia cerealis* (van der Hoeven). The yellow patch stage is the name denoting the spring chlorotic phase of disease. This disease is also known as winter *Rhizoctonia*. Yellow patch was present in all low N bentgrass plots

Table 12. *Sclerotinia homoeocarpa* Combined Mean Response of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels for September 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *S. homoeocarpa* Rating[1] | | | *S. homoeocarpa* Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.2 | a | Beno x Bens | 7.2 | a |
| Beno x DCPA | 5.8 | a b | Beno x DCPA | 7.1 | a |
| Beno x Oxad | 5.5 | b | Beno x Oxad | 6.9 | a |
| Chlo x Bens | 5.6 | b | Chlo x Bens | 7.2 | a |
| Chlo x DCPA | 5.7 | a b | Chlo x DCPA | 7.0 | a |
| Chlo x Oxad | 5.9 | a b | Chlo x Oxad | 6.8 | a b |
| Tria x Bens | 5.1 | b c | Tria x Bens | 6.8 | a b |
| Tria x DCPA | 5.6 | b | Tria x DCPA | 7.0 | a |
| Tria x Oxad | 5.4 | b | Tria x Oxad | 6.5 | b |
| Check | 5.4 | b | Check | 7.2 | a |

[1]*S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

by April and was particularly prevalent in untreated check plots and plots treated with benomyl. By May, under low N, yellow patch incidence increased in pesticide interaction plots of chlorothalonil with DCPA and with bensulide. Very little yellow patch was noted in high N plots during May.

Yellow patch incidence in bentgrass subsided by mid-June. Bentgrass recovery from yellow patch injury occurred during early July.

## VI. STAND DENSITY

Stand density is a measure of percent live bentgrass sod. Loss of stand density is due only to dead grass resulting from disease or pesticide phytotoxicity. Leaf burn, discoloration and quality appearance are not included in these measurements.

Combined mean response for individual treatments revealed no particularly significant loss of sod resulting from chemical phytotoxicity or predisposition to pathogenic attacks under either low or high N (Table 13). Some significant sod loss occasionally occurred on individual dates. Under low N, chlorothalonil contributed to significant sod loss as shown on June 13 and July 14 (Tables D-4 and D-5), but bentgrass recovered by July 28 (Table D-6).

Individual pesticides under high N appeared to have a more profound influence on sod loss. Significant sod loss occurred by April 28 with benomyl and chlorothalonil (Table D-1). However, bentgrass recovered during May and June (Tables D-2, D-3, and D-4).

Table 13. Stand Density Combined Mean of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 84 | b | Benomyl | 86 | a b |
| Chlorothalonil | 83 | b | Chlorothalonil | 85 | a b |
| Triadimefon | 91 | a | Triadimefon | 89 | a |
| Bensulide | 83 | b | Bensulide | 84 | a b |
| DCPA | 83 | b | DCPA | 85 | a b |
| Oxadiazon | 86 | a b | Oxadiazon | 85 | a b |
| Check | 84 | b | Check | 86 | a b |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Significant sod loss occurred again by July 14 but only in plots treated with the three herbicides (Table D-5). By July 28, significant sod loss occurred only in plots treated with chlorothalonil and bensulide (Table D-6), however, no sod loss was apparent by August 13 (Table D-7).

Combined interaction means of all rating dates were similar to combined individual mean effects under low and high N (Table 14). Again, no particular pesticide combination consistently influenced bentgrass sod loss.

Individual rating dates of combined pesticide effects under low N showed significant sod loss by June 13 with treatments of benomyl x bensulide and chlorothalonil x DCPA (Table D-11). By July 14, significant sod loss occurred only in the plots treated with chlorothalonil x bensulide (Table D-12). Bentgrass recovered and exhibited no significant loss of sod for the remainder of the study under low N.

Sod loss under high N was significantly greater for individual dates than when viewed as combined means. Significant sod loss occurred with treatments of chlorothalonil with bensulide and with DCPA by April 28 (Table D-8). Bentgrass sod recovered throughout May and June (Tables D-9, D-10, and D-11). By July 14, significant sod loss resulted with all treatment combinations except triadimefon with bensulide and with DCPA (Table D-12). By July 28, sod loss was significant only in plot treatments of chlorothalonil with bensulide and with oxadiazon, and with triadimefon x bensulide

Table 14. Stand Density Combined Mean of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 85 | a b | Beno x Bens | 86 | a b |
| Beno x DCPA | 86 | a b | Beno x DCPA | 84 | a b |
| Beno x Oxad | 86 | a b | Beno x Oxad | 84 | a b |
| Chlo x Bens | 84 | b | Chlo x Bens | 83 | a b |
| Chlo x DCPA | 83 | b | Chlo x DCPA | 84 | a b |
| Chlo x Oxad | 84 | b | Chlo x Oxad | 84 | a b |
| Tria x Bens | 91 | a | Tria x Bens | 88 | a |
| Tria x DCPA | 91 | a | Tria x DCPA | 89 | a |
| Tria x Oxad | 90 | a | Tria x Oxad | 88 | a |
| Check | 84 | b | Check | 86 | a b |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

(Table D-13). Results of August 13, indicated significant sod loss with benomyl combined with each of the three herbicides (Table D-14).

Pesticide associated sod loss in this study was seldom severe but just great enough to be significant. Pesticide treatments never caused sod loss in excess of 10 percent of check plot density (Tables D-11, D-12, and D-14). However, sod loss was greatest and involved the largest number of pesticide treatments after R. solani inoculations began on June 14 (Tables D-5, D-6, D-12, D-13, and D-14). Indications thus are reinforced that selected pesticides do predispose bentgrass to easier attack by certain pathogens.

## VII. QUALITY APPEARANCE

Quality appearance is a composite value combining color, stand density, disease, and pesticide effects. Quality reflects more precisely the general health and strength of the turfgrass and its ability to tolerate specified stress factors.

Combined means for individual treatments reflect the severe leaf burn of bentgrass caused by oxadiazon under both low and high N (Table 15). However, individual treatments by rating dates also show a significant loss of sod quality with treatments of triadimefon under low N (Tables E-1 and E-3), and under high N (Tables E-2, E-3, and E-4). Bentgrass leaf discoloration caused by triadimefon was not evident by the end of June. The only other chemical causing loss of sod was chlorothalonil under low N (Tables E-3 and E-5), and benomyl briefly under high N (Table E-3). The only chemical

Table 15. Quality Appearance Combined Mean of a Bentgrass Green as Influenced by Individual Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.1 | a | Benomyl | 5.0 | b |
| Chlorothalonil | 4.9 | a | Chlorothalonil | 5.7 | a |
| Triadimefon | 4.7 | a b | Triadimefon | 4.8 | b c |
| Bensulide | 4.9 | a | Bensulide | 5.3 | b |
| DCPA | 5.2 | a | DCPA | 5.2 | b |
| Oxadiazon | 3.8 | c | Oxadiazon | 4.3 | c |
| Check | 5.0 | a | Check | 5.2 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

associated with loss of sod quality when _R. solani_ inoculations began was chlorothalonil under low N on July 14 (Table E-5). Effects of oxadiazon had dissipated sufficiently so that no significant loss of bentgrass quality could be attributed to this chemical after _R. solani_ inoculations began.

Oxadiazon, in combination with each of the three fungicides, under low and high N, resulted in reduction of bentgrass quality when composite combination means are examined (Table 16). However, individual rating dates revealed bentgrass growth related problems with other pesticide combinations. By May 26, all pesticide combinations influenced significant loss of quality under low N, and all but chlorothalonil combinations with the three herbicides reduced quality under high N (Table E-10). These effects occurred well in advance of _R. solani_ inoculations and during spring. Thus, significant loss of quality is attributable to interacting effects of the pesticides on the turfgrass and enhanced activity of background diseases.

After _R. solani_ inoculations began, significant loss of quality was attributed increasingly to low N and selected pesticide combinations. By July 14, under low N, significant reduced quality occurred with all chlorothalonil herbicide combinations, benomyl x DCPA and benomyl x oxadiazon (Table E-12). All plots recovered by the end of July. However, reduced quality reoccurred in chlorothalonil x bensulide plots by August 13 (Table E-14).

Table 16. Quality Appearance Combined Mean of a Bentgrass Green as Influenced by Combinations of Fungicides and Herbicides Under Two N Levels During 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.8 | a b | Beno x Bens | 5.1 | b |
| Beno x DCPA | 5.0 | a | Beno x DCPA | 4.8 | b c |
| Beno x Oxad | 3.5 | c | Beno x Oxad | 3.7 | d |
| Chlo x Bens | 4.5 | a b | Chlo x Bens | 4.1 | b |
| Chlo x DCPA | 4.6 | a b | Chlo x DCPA | 5.4 | a b |
| Chlo x Oxad | 3.5 | c | Chlo x Oxad | 3.9 | d |
| Tria x Bens | 4.7 | a b | Tria x Bens | 4.5 | b c |
| Tria x DCPA | 4.7 | a b | Tria x DCPA | 4.9 | b c |
| Tria x Oxad | 3.9 | c | Tria x Oxad | 3.8 | d |
| Check | 5.0 | a | Check | 5.2 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Under high N, after *R. solani* inoculations, significant loss of quality resulted in plots treated with chlorothalonil x bensulide (Tables E-12 and E-13), benomyl x DCPA, chlorothalonil x oxadiazon, and triadimefon x bensulide (Table E-13). All plots recovered by August 13 (Table E-14).

# CHAPTER V

## SUMMARY AND CONCLUSIONS

A study of the effects of selected pesticides under two nitrogen levels on the susceptibility of Penncross creeping bentgrass to *Rhizoctonia solani*, which causes large brown patch disease, was conducted from March to October 1982. In an effort to stress bentgrass in a limited period of time, excessive chemical rates were used.

Quality appearance of bentgrass aided little in determining pesticide predisposition of bentgrass to disease. However, specific response factors such as fungus activity, foliage color, and stand density provided indications of chemical effects on bentgrass and subsequent disease.

Results indicate that pesticides can predispose bentgrass to pathogenic fungi. A significant increase in *R. solani* occurred under low N with treatments of benomyl and DCPA each used alone. Neither chemical significantly reduced stand density or caused loss of bentgrass green color. Although chlorothalonil, triadimefon, and oxadiazon caused foliage burn or discoloration, they did not contribute to a significant increase in *R. solani* nor to reduction in stand density. Benomyl, DCPA, and oxadiazon were associated with increased incidence of the dollar spot disease, caused by *Sclerotinia homoeocarpa* under low N.

Benomyl was the only treatment under high N that induced a significant increase in R. solani. This fungicide also caused bentgrass foliage discoloration. Loss of bentgrass color resulted with treatments of chlorothalonil, triadimefon, and oxadiazon but these chemicals did not predispose bentgrass to a significant increase in R. solani. All three herbicides caused a reduction in bentgrass stand but did not effect a significant increase in R. solani. High N appeared to counteract effects of all pesticides tested with no significant increase in dollar spot.

A significant increase in R. solani occurred when benomyl and triadimefon were used in combination with each of the three herbicides under low N conditions. Oxadiazon in combination with each of the three fungicides caused loss of bentgrass color. None of the pesticide combinations resulted in a reduced stand. However, significant increases in dollar spot occurred when benomyl was combined with oxadiazon, chlorothalonil in combination with bensulide and with oxadiazon, and triadimefon in combination with each of the three herbicides.

Benomyl and triadimefon, each in combination with the three herbicides under high N, caused an increase in R. solani incidence. Loss of bentgrass green color also occurred when benomyl was combined with each of the three herbicides and with triadimefon x oxadiazon. Chlorothalonil, in combination with each of the three herbicides, caused loss of foliage color, and chlorothalonil, in combination with bensulide and with oxadiazon, resulted in reduced stand; however, these chemical combinations did not effect a significant increase in _R. solani_ severity. Benomyl and triadimefon herbicide combinations did significantly predispose bentgrass to the dollar spot pathogen.

Oxadiazon caused severe foliage burn when used alone and in combination with other pesticides under low and high N. However, a significant increase of _R. solani_ occurred only under high N when oxadiazon was used in combination with each of the three fungicides. This chemical was implicated in a significant increase of dollar spot following a single treatment.

Chemical effects on bentgrass and _R. solani_ incidence were easier to detect under high N as compared to low N. Occurrence of dollar spot appeared to be greater under low N.

This study provides evidence that bentgrass can be predisposed to _R. solani_, and other pathogenic fungi, by benomyl and DCPA. Specific chemicals implicated, when used in combination treatments with herbicides, were benomyl and triadimefon.

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APPENDIXES

APPENDIX A

Table A-1. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | a | Benomyl | 3.0 | c |
| Chlorothalonil | 5.0 | a | Chlorothalonil | 3.0 | c |
| Triadimefon | 2.0 | c | Triadimefon | 4.0 | b |
| Bensulide | 4.0 | b | Bensulide | 4.0 | b |
| DCPA | 4.0 | b | DCPA | 5.0 | a |
| Oxadiazon | 1.0 | c | Oxadiazon | 1.0 | d |
| Check | 4.0 | b | Check | 4.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-2. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.5 | a | Benomyl | 7.0 | a |
| Chlorothalonil | 5.5 | a | Chlorothalonil | 6.8 | a |
| Triadimefon | 5.5 | a | Triadimefon | 5.5 | b |
| Bensulide | 5.5 | a | Bensulide | 7.0 | a |
| DCPA | 5.3 | a | DCPA | 7.0 | a |
| Oxadiazon | 2.0 | b | Oxadiazon | 2.0 | c |
| Check | 5.8 | a | Check | 7.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-3. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.0 | b | Benomyl | 6.0 | a |
| Chlorothalonil | 4.0 | b | Chlorothalonil | 6.0 | a |
| Triadimefon | 6.0 | a | Triadimefon | 2.0 | b |
| Bensulide | 4.5 | b | Bensulide | 6.0 | a |
| DCPA | 4.3 | b | DCPA | 6.0 | a |
| Oxadiazon | 4.5 | b | Oxadiazon | 6.0 | a |
| Check | 5.8 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-4. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.0 | b | Benomyl | 6.0 | a |
| Chlorothalonil | 4.0 | b | Chlorothalonil | 6.0 | a |
| Triadimefon | 6.0 | a | Triadimefon | 2.0 | b |
| Bensulide | 4.3 | a b | Bensulide | 6.0 | a |
| DCPA | 4.3 | a b | DCPA | 6.0 | a |
| Oxadiazon | 4.5 | a b | Oxadiazon | 6.0 | a |
| Check | 5.8 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-5. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | a | Benomyl | 6.0 | a |
| Chlorothalonil | 5.0 | a | Chlorothalonil | 6.0 | a |
| Triadimefon | 5.0 | a | Triadimefon | 6.0 | a |
| Bensulide | 5.0 | a | Bensulide | 6.0 | a |
| DCPA | 5.0 | a | DCPA | 6.0 | a |
| Oxadiazon | 5.0 | a | Oxadiazon | 6.0 | a |
| Check | 5.0 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-6. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | a | Benomyl | 4.0 | c |
| Chlorothalonil | 2.0 | b | Chlorothalonil | 4.0 | c |
| Triadimefon | 5.0 | a | Triadimefon | 6.0 | a |
| Bensulide | 2.0 | b | Bensulide | 5.0 | b |
| DCPA | 2.0 | b | DCPA | 5.0 | b |
| Oxadiazon | 2.0 | b | Oxadiazon | 5.0 | b |
| Check | 2.0 | b | Check | 5.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-7. Foliage Color Response of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 2.0 | b | Benomyl | 4.0 | c |
| Chlorothalonil | 2.0 | b | Chlorothalonil | 5.0 | b |
| Triadimefon | 5.0 | a | Triadimefon | 6.0 | a |
| Bensulide | 2.0 | b | Bensulide | 5.0 | b |
| DCPA | 2.0 | b | DCPA | 5.0 | b |
| Oxadiazon | 2.0 | b | Oxadiazon | 5.0 | b |
| Check | 2.0 | b | Check | 5.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-8. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.0 | a | Beno x Bens | 3.0 | c |
| Beno x DCPA | 5.3 | a | Beno x DCPA | 3.0 | c |
| Beno x Oxad | 3.0 | c | Beno x Oxad | 1.0 | d |
| Chlo x Bens | 4.8 | a b | Chlo x Bens | 3.0 | c |
| Chlo x DCPA | 4.8 | a b | Chlo x DCPA | 3.0 | c |
| Chlo x Oxad | 1.0 | d | Chlo x Oxad | 1.0 | d |
| Tria x Bens | 2.0 | c | Tria x Bens | 4.0 | b |
| Tria x DCPA | 2.0 | c | Tria x DCPA | 4.0 | b |
| Tria x Oxad | 1.0 | d | Tria x Oxad | 1.0 | d |
| Check | 4.0 | b | Check | 4.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-9. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.5 | a | Beno x Bens | 6.8 | a |
| Beno x DCPA | 6.0 | a | Beno x DCPA | 6.5 | a |
| Beno x Oxad | 2.0 | b | Beno x Oxad | 2.0 | c |
| Chlo x Bens | 5.5 | a | Chlo x Bens | 6.5 | a |
| Chlo x DCPA | 5.8 | a | Chlo x DCPA | 7.0 | a |
| Chlo x Oxad | 1.8 | b | Chlo x Oxad | 2.0 | c |
| Tria x Bens | 5.3 | a | Tria x Bens | 6.8 | a |
| Tria x DCPA | 5.3 | a | Tria x DCPA | 6.8 | a |
| Tria x Oxad | 1.8 | b | Tria x Oxad | 2.0 | c |
| Check | 5.8 | a | Check | 7.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-10. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.3 | b | Beno x Bens | 6.0 | a |
| Beno x DCPA | 3.3 | c | Beno x DCPA | 6.0 | a |
| Beno x Oxad | 3.0 | c | Beno x Oxad | 6.0 | a |
| Chlo x Bens | 4.0 | b | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 4.0 | b | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 4.0 | b | Chlo x Oxad | 6.0 | a |
| Tria x Bens | 6.0 | a | Tria x Bens | 2.0 | b |
| Tria x DCPA | 6.0 | a | Tria x DCPA | 2.0 | b |
| Tria x Oxad | 6.0 | a | Tria x Oxad | 2.0 | b |
| Check | 6.0 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-11. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.3 | a b | Beno x Bens | 6.0 | a |
| Beno x DCPA | 3.3 | c | Beno x DCPA | 6.0 | a |
| Beno x Oxad | 3.0 | c | Beno x Oxad | 6.0 | a |
| Chlo x Bens | 4.0 | b | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 4.0 | b | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 4.0 | b | Chlo x Oxad | 6.0 | a |
| Tria x Bens | 6.0 | a | Tria x Bens | 2.0 | b |
| Tria x DCPA | 6.0 | a | Tria x DCPA | 2.0 | b |
| Tria x Oxad | 6.0 | a | Tria x Oxad | 2.0 | b |
| Check | 5.8 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-12. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.0 | a | Beno x Bens | 6.0 | a |
| Beno x DCPA | 5.0 | a | Beno x DCPA | 6.0 | a |
| Beno x Oxad | 5.0 | a | Beno x Oxad | 6.0 | a |
| Chlo x Bens | 5.0 | a | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 5.0 | a | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 5.0 | a | Chlo x Oxad | 6.0 | a |
| Tria x Bens | 5.0 | a | Tria x Bens | 6.0 | a |
| Tria x DCPA | 5.0 | a | Tria x DCPA | 6.0 | a |
| Tria x Oxad | 5.0 | a | Tria x Oxad | 6.0 | a |
| Check | 5.0 | a | Check | 6.0 | a |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-13. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 2.0 | b | Beno x Bens | 4.0 | c |
| Beno x DCPA | 2.0 | b | Beno x DCPA | 4.0 | c |
| Beno x Oxad | 2.0 | b | Beno x Oxad | 4.0 | c |
| Chlo x Bens | 2.0 | b | Chlo x Bens | 5.0 | b |
| Chlo x DCPA | 2.0 | b | Chlo x DCPA | 5.0 | b |
| Chlo x Oxad | 2.0 | b | Chlo x Oxad | 5.0 | b |
| Tria x Bens | 5.0 | a | Tria x Bens | 6.0 | a |
| Tria x DCPA | 5.0 | a | Tria x DCPA | 6.0 | a |
| Tria x Oxad | 5.0 | a | Tria x Oxad | 6.0 | a |
| Check | 2.0 | b | Check | 5.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table A-14. Foliage Color Response of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Color Rating[1] | | | Color Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 2.0 | b | Beno x Bens | 4.0 | c |
| Beno x DCPA | 2.0 | b | Beno x DCPA | 4.0 | c |
| Beno x Oxad | 2.0 | b | Beno x Oxad | 4.0 | c |
| Chlo x Bens | 2.0 | b | Chlo x Bens | 5.0 | b |
| Chlo x DCPA | 2.0 | b | Chlo x DCPA | 5.0 | b |
| Chlo x Oxad | 2.0 | b | Chlo x Oxad | 5.0 | b |
| Tria x Bens | 5.0 | a | Tria x Bens | 6.0 | a |
| Tria x DCPA | 5.0 | a | Tria x DCPA | 6.0 | a |
| Tria x Oxad | 5.0 | a | Tria x Oxad | 6.0 | a |
| Check | 2.0 | b | Check | 5.0 | b |

[1]Color: 1 to 8; 1 = brown, 8 = dark green.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

APPENDIX B

Table B-1. Pre-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 8.0 | a | Benomyl | 8.0 | a |
| Chlorothalonil | 8.0 | a | Chlorothalonil | 8.0 | a |
| Triadimefon | 8.0 | a | Triadimefon | 8.0 | a |
| Bensulide | 8.0 | a | Bensulide | 8.0 | a |
| DCPA | 8.0 | a | DCPA | 8.0 | a |
| Oxadiazon | 8.0 | a | Oxadiazon | 8.0 | a |
| Check | 8.0 | a | Check | 8.0 | a |

[1] *R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-2. Pre-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | b c | Benomyl | 3.0 | c |
| Chlorothalonil | 4.0 | c | Chlorothalonil | 6.0 | b |
| Triadimefon | 5.8 | b | Triadimefon | 6.0 | b |
| Bensulide | 3.5 | d | Bensulide | 6.0 | b |
| DCPA | 4.8 | b c | DCPA | 6.0 | b |
| Oxadiazon | 8.0 | a | Oxadiazon | 8.0 | a |
| Check | 4.3 | b c | Check | 6.0 | b |

[1] R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-3. Pre-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 6.0 | a | Benomyl | 7.0 | a |
| Chlorothalonil | 3.5 | c | Chlorothalonil | 7.0 | a |
| Triadimefon | 3.8 | c | Triadimefon | 7.0 | a |
| Bensulide | 5.5 | a b | Bensulide | 7.0 | a |
| DCPA | 4.0 | c | DCPA | 7.0 | a |
| Oxadiazon | 6.0 | a | Oxadiazon | 7.0 | a |
| Check | 5.5 | a b | Check | 7.0 | a |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-4. Pre-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.0 | c | Benomyl | 6.0 | a |
| Chlorothalonil | 4.0 | c | Chlorothalonil | 6.0 | a |
| Triadimefon | 4.0 | c | Triadimefon | 6.0 | a |
| Bensulide | 5.0 | b | Bensulide | 6.0 | a |
| DCPA | 4.0 | c | DCPA | 6.0 | a |
| Oxadiazon | 4.0 | c | Oxadiazon | 6.0 | a |
| Check | 5.0 | b | Check | 6.0 | a |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-5. Pre-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 8.0 | a | Beno x Bens | 8.0 | a |
| Beno x DCPA | 8.0 | a | Beno x DCPA | 8.0 | a |
| Beno x Oxad | 8.0 | a | Beno x Oxad | 8.0 | a |
| Chlo x Bens | 8.0 | a | Chlo x Bens | 8.0 | a |
| Chlo x DCPA | 8.0 | a | Chlo x DCPA | 8.0 | a |
| Chlo x Oxad | 8.0 | a | Chlo x Oxad | 8.0 | a |
| Tria x Bens | 8.0 | a | Tria x Bens | 8.0 | a |
| Tria x DCPA | 8.0 | a | Tria x DCPA | 8.0 | a |
| Tria x Oxad | 8.0 | a | Tria x Oxad | 8.0 | a |
| Check | 8.0 | a | Check | 8.0 | a |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-6. Pre-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.0 | c | Beno x Bens | 6.0 | b |
| Beno x DCPA | 3.8 | d | Beno x DCPA | 6.0 | b |
| Beno x Oxad | 8.0 | a | Beno x Oxad | 8.0 | a |
| Chlo x Bens | 4.5 | b c | Chlo x Bens | 6.0 | b |
| Chlo x DCPA | 2.5 | d | Chlo x DCPA | 6.0 | b |
| Chlo x Oxad | 8.0 | a | Chlo x Oxad | 8.0 | a |
| Tria x Bens | 5.8 | b | Tria x Bens | 4.8 | c |
| Tria x DCPA | 5.8 | b | Tria x DCPA | 6.0 | b |
| Tria x Oxad | 8.0 | a | Tria x Oxad | 8.0 | a |
| Check | 4.3 | c | Check | 6.0 | b |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-7. Pre-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.0 | a | Beno x Bens | 7.0 | a |
| Beno x DCPA | 5.0 | b | Beno x DCPA | 6.3 | b |
| Beno x Oxad | 6.0 | a | Beno x Oxad | 7.0 | a |
| Chlo x Bens | 6.0 | a | Chlo x Bens | 7.0 | a |
| Chlo x DCPA | 3.3 | c | Chlo x DCPA | 7.0 | a |
| Chlo x Oxad | 3.0 | c | Chlo x Oxad | 7.0 | a |
| Tria x Bens | 6.0 | a | Tria x Bens | 7.0 | a |
| Tria x DCPA | 6.0 | a | Tria x DCPA | 7.0 | a |
| Tria x Oxad | 6.0 | a | Tria x Oxad | 7.0 | a |
| Check | 5.5 | a b | Check | 7.0 | a |

[1] *R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Chemical abbreviations: (See Tables 1 and 2).

[3] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-8. Pre-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | | High Nitrogen | | |
|---|---|---|---|---|---|---|
| | *R. solani* Rating[1] | | | | *R. solani* Rating | |
| Chemicals[2] | Means | DMR[3] | | Chemicals | Means | DMR |
| Beno x Bens | 4.0 | c | | Beno x Bens | 6.0 | a |
| Beno x DCPA | 4.0 | c | | Beno x DCPA | 6.0 | a |
| Beno x Oxad | 5.0 | b | | Beno x Oxad | 6.0 | a |
| Chlo x Bens | 5.8 | a | | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 3.0 | d | | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 4.0 | c | | Chlo x Oxad | 6.0 | a |
| Tria x Bens | 5.0 | b | | Tria x Bens | 6.0 | a |
| Tria x DCPA | 5.0 | b | | Tria x DCPA | 6.0 | a |
| Tria x Oxad | 4.8 | b | | Tria x Oxad | 6.0 | a |
| Check | 5.0 | b | | Check | 6.0 | a |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-9. Post-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 7.0 | a | Benomyl | 7.0 | a |
| Chlorothalonil | 7.0 | a | Chlorothalonil | 7.0 | a |
| Triadimefon | 7.0 | a | Triadimefon | 7.0 | a |
| Bensulide | 7.0 | a | Bensulide | 7.0 | a |
| DCPA | 7.0 | a | DCPA | 7.0 | a |
| Oxadiazon | 7.0 | a | Oxadiazon | 7.0 | a |
| Check | 7.0 | a | Check | 7.0 | a |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-10. Post-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | b | Benomyl | 4.0 | a |
| Chlorothalonil | 5.0 | b | Chlorothalonil | 4.0 | a |
| Triadimefon | 6.0 | a | Triadimefon | 4.0 | a |
| Bensulide | 3.0 | d | Bensulide | 4.0 | a |
| DCPA | 4.3 | c | DCPA | 4.0 | a |
| Oxadiazon | 4.0 | c | Oxadiazon | 4.0 | a |
| Check | 3.0 | d | Check | 4.0 | a |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-11. Post-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.3 | d | Benomyl | 2.8 | d |
| Chlorothalonil | 6.0 | b | Chlorothalonil | 5.0 | b |
| Triadimefon | 7.0 | a | Triadimefon | 6.0 | a |
| Bensulide | 5.0 | c | Bensulide | 3.5 | c d |
| DCPA | 3.8 | e | DCPA | 4.0 | c |
| Oxadiazon | 5.0 | c | Oxadiazon | 4.0 | c |
| Check | 5.0 | c | Check | 3.8 | c |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-12. Post-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *R. solani* Rating[1] | | | *R. solani* Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 7.0 | a | Beno x Bens | 7.0 | a |
| Beno x DCPA | 7.0 | a | Beno x DCPA | 7.0 | a |
| Beno x Oxad | 7.0 | a | Beno x Oxad | 7.0 | a |
| Chlo x Bens | 7.0 | a | Chlo x Bens | 7.0 | a |
| Chlo x DCPA | 7.0 | a | Chlo x DCPA | 7.0 | a |
| Chlo x Oxad | 7.0 | a | Chlo x Oxad | 7.0 | a |
| Tria x Bens | 7.0 | a | Tria x Bens | 7.0 | a |
| Tria x DCPA | 7.0 | a | Tria x DCPA | 7.0 | a |
| Tria x Oxad | 7.0 | a | Tria x Oxad | 7.0 | a |
| Check | 7.0 | a | Check | 7.0 | a |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-13. Post-Inoculation *Rhizoctonia solani* Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.0 | b | Beno x Bens | 4.0 | a |
| Beno x DCPA | 5.0 | b | Beno x DCPA | 4.0 | a |
| Beno x Oxad | 5.0 | b | Beno x Oxad | 4.0 | a |
| Chlo x Bens | 4.0 | c | Chlo x Bens | 2.0 | b |
| Chlo x DCPA | 4.0 | c | Chlo x DCPA | 4.0 | a |
| Chlo x Oxad | 4.0 | c | Chlo x Oxad | 4.0 | a |
| Tria x Bens | 6.0 | a | Tria x Bens | 4.0 | a |
| Tria x DCPA | 6.0 | a | Tria x DCPA | 4.0 | a |
| Tria x Oxad | 6.0 | a | Tria x Oxad | 4.0 | a |
| Check | 3.0 | d | Check | 4.0 | a |

[1]*R. solani* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table B-14. Post-Inoculation Rhizoctonia solani Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | R. solani Rating[1] | | | R. solani Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 2.0 | e | Beno x Bens | 2.5 | d |
| Beno x DCPA | 2.8 | e | Beno x DCPA | 2.0 | d |
| Beno x Oxad | 3.3 | e | Beno x Oxad | 1.8 | d |
| Chlo x Bens | 1.5 | e | Chlo x Bens | 1.5 | d |
| Chlo x DCPA | 2.5 | e | Chlo x DCPA | 2.8 | d |
| Chlo x Oxad | 4.3 | d | Chlo x Oxad | 3.3 | c d |
| Tria x Bens | 6.5 | a b | Tria x Bens | 5.5 | a b |
| Tria x DCPA | 5.0 | c | Tria x DCPA | 6.0 | a |
| Tria x Oxad | 5.5 | b c | Tria x Oxad | 6.0 | a |
| Check | 5.0 | c | Check | 3.8 | c |

[1]R. solani susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

APPENDIX C

Table C-1. *Sclerotinia homoeocarpa* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on September 1, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *S. homoeocarpa* Rating[1] | | | *S. homoeocarpa* Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.5 | b | Benomyl | 8.0 | a |
| Chlorothalonil | 6.5 | a | Chlorothalonil | 8.0 | a |
| Triadimefon | 5.5 | b | Triadimefon | 8.0 | a |
| Bensulide | 6.3 | a | Bensulide | 8.0 | a |
| DCPA | 5.0 | b | DCPA | 8.0 | a |
| Oxadiazon | 6.3 | a | Oxadiazon | 8.0 | a |
| Check | 6.8 | a | Check | 8.0 | a |

[1]*S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-2. Sclerotinia homoeocarpa Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on September 8, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | S. homoeocarpa Rating[1] | | | S. homoeocarpa Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.5 | b | Benomyl | 8.0 | a |
| Chlorothalonil | 6.0 | b | Chlorothalonil | 8.0 | a |
| Triadimefon | 5.3 | b | Triadimefon | 8.0 | a |
| Bensulide | 5.5 | b | Bensulide | 8.0 | a |
| DCPA | 5.0 | c | DCPA | 8.0 | a |
| Oxadiazon | 5.0 | c | Oxadiazon | 8.0 | a |
| Check | 6.3 | a b | Check | 8.0 | a |

[1]S. homoeocarpa susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-3. *Sclerotinia homoeocarpa* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on September 15, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *S. homoeocarpa* Rating[1] | | | *S. homoeocarpa* Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.0 | d | Benomyl | 5.3 | b c |
| Chlorothalonil | 6.8 | a | Chlorothalonil | 5.8 | b |
| Triadimefon | 6.5 | a | Triadimefon | 5.0 | b c |
| Bensulide | 5.0 | b c | Bensulide | 4.8 | c |
| DCPA | 4.5 | c | DCPA | 5.5 | b |
| Oxadiazon | 4.5 | c | Oxadiazon | 6.0 | a b |
| Check | 5.0 | b c | Check | 5.5 | b |

[1]*S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-4. *Sclerotinia homoeocarpa* Incidence in a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on September 22, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *S. homoeocarpa* Rating[1] | | | *S. homoeocarpa* Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 3.0 | c | Benomyl | 5.8 | b |
| Chlorothalonil | 6.5 | a | Chlorothalonil | 6.3 | a b |
| Triadimefon | 5.8 | b | Triadimefon | 5.8 | b |
| Bensulide | 4.3 | c | Bensulide | 6.3 | a b |
| DCPA | 4.3 | c | DCPA | 5.0 | c |
| Oxadiazon | 3.3 | c d | Oxadiazon | 4.8 | c |
| Check | 3.5 | c | Check | 7.3 | a |

[1] *S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2] Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-5. *Sclerotinia homoeocarpa* Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on September 1, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | *S. homoeocarpa* Rating[1] | | | *S. homoeocarpa* Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.0 | a b | Beno x Bens | 8.0 | a |
| Beno x DCPA | 6.8 | a | Beno x DCPA | 8.0 | a |
| Beno x Oxad | 5.8 | b | Beno x Oxad | 8.0 | a |
| Chlo x Bens | 5.8 | b | Chlo x Bens | 8.0 | a |
| Chlo x DCPA | 6.0 | a b | Chlo x DCPA | 8.0 | a |
| Chlo x Oxad | 5.0 | b | Chlo x Oxad | 8.0 | a |
| Tria x Bens | 4.5 | c | Tria x Bens | 8.0 | a |
| Tria x DCPA | 5.5 | b | Tria x DCPA | 8.0 | a |
| Tria x Oxad | 3.5 | c | Tria x Oxad | 8.0 | a |
| Check | 6.8 | a | Check | 8.0 | a |

[1]*S. homoeocarpa* susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-6. Sclerotinia homoeocarpa Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on September 8, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | S. homoeocarpa Rating[1] | | | S. homoeocarpa Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.3 | a b | Beno x Bens | 8.0 | a |
| Beno x DCPA | 7.0 | a | Beno x DCPA | 8.0 | a |
| Beno x Oxad | 5.0 | c | Beno x Oxad | 8.0 | a |
| Chlo x Bens | 4.3 | c | Chlo x Bens | 8.0 | a |
| Chlo x DCPA | 6.8 | a | Chlo x DCPA | 8.0 | a |
| Chlo x Oxad | 5.5 | b | Chlo x Oxad | 8.0 | a |
| Tria x Bens | 6.5 | a | Tria x Bens | 8.0 | a |
| Tria x DCPA | 7.0 | a | Tria x DCPA | 8.0 | a |
| Tria x Oxad | 6.0 | b | Tria x Oxad | 8.0 | a |
| Check | 6.3 | a b | Check | 8.0 | a |

[1]S. homoeocarpa susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-7. Sclerotinia homoeocarpa Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on September 15, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | S. homoeocarpa Rating[1] | | | S. homoeocarpa Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.3 | a b | Beno x Bens | 5.5 | b |
| Beno x DCPA | 5.0 | b c | Beno x DCPA | 6.5 | a |
| Beno x Oxad | 5.8 | b | Beno x Oxad | 6.0 | a b |
| Chlo x Bens | 5.5 | b | Chlo x Bens | 5.8 | b |
| Chlo x DCPA | 4.3 | c d | Chlo x DCPA | 5.5 | b |
| Chlo x Oxad | 6.3 | a b | Chlo x Oxad | 6.3 | a |
| Tria x Bens | 5.8 | b | Tria x Bens | 6.0 | a b |
| Tria x DCPA | 5.5 | b | Tria x DCPA | 6.5 | a |
| Tria x Oxad | 6.3 | a b | Tria x Oxad | 4.8 | c |
| Check | 5.0 | b c | Check | 5.5 | b |

[1]S. homoeocarpa susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table C-8. Sclerotinia homoeocarpa Incidence in a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on September 22, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | S. homoeocarpa Rating[1] | | | S. homoeocarpa Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.3 | a b | Beno x Bens | 7.3 | a |
| Beno x DCPA | 4.3 | c | Beno x DCPA | 5.8 | b |
| Beno x Oxad | 5.3 | b | Beno x Oxad | 5.5 | b c |
| Chlo x Bens | 6.8 | a | Chlo x Bens | 6.8 | a |
| Chlo x DCPA | 5.8 | b | Chlo x DCPA | 6.3 | a b |
| Chlo x Oxad | 6.8 | a | Chlo x Oxad | 5.0 | c |
| Tria x Bens | 3.5 | c | Tria x Bens | 5.3 | c |
| Tria x DCPA | 4.3 | c | Tria x DCPA | 5.3 | c |
| Tria x Oxad | 5.8 | b | Tria x Oxad | 5.0 | c |
| Check | 3.5 | c | Check | 7.3 | a |

[1]S. homoeocarpa susceptibility: 1 to 8; 1 = total kill, 8 = none.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

# APPENDIX D

Table D-1. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 100 | a | Benomyl | 92 | c |
| Chlorothalonil | 100 | a | Chlorothalonil | 92 | c |
| Triadimefon | 100 | a | Triadimefon | 100 | a |
| Bensulide | 100 | a | Bensulide | 100 | a |
| DCPA | 100 | a | DCPA | 100 | a |
| Oxadiazon | 100 | a | Oxadiazon | 100 | a |
| Check | 100 | a | Check | 100 | a |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-2. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 85 | a | Benomyl | 85 | b |
| Chlorothalonil | 85 | a | Chlorothalonil | 85 | b |
| Triadimefon | 85 | a | Triadimefon | 96 | a |
| Bensulide | 85 | a | Bensulide | 82 | b |
| DCPA | 85 | a | DCPA | 82 | b |
| Oxadiazon | 90 | a | Oxadiazon | 82 | b |
| Check | 85 | a | Check | 82 | b |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-3. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 85 | a | Benomyl | 85 | a |
| Chlorothalonil | 85 | a | Chlorothalonil | 85 | a |
| Triadimefon | 85 | a | Triadimefon | 85 | a |
| Bensulide | 82 | a | Bensulide | 85 | a |
| DCPA | 77 | b c | DCPA | 85 | a |
| Oxadiazon | 85 | a | Oxadiazon | 85 | a |
| Check | 80 | b c | Check | 85 | a |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-4. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 82 | a b | Benomyl | 85 | a |
| Chlorothalonil | 78 | b c | Chlorothalonil | 85 | a |
| Triadimefon | 85 | a | Triadimefon | 85 | a |
| Bensulide | 85 | a | Bensulide | 85 | a |
| DCPA | 80 | a b | DCPA | 85 | a |
| Oxadiazon | 85 | a | Oxadiazon | 85 | a |
| Check | 85 | a | Check | 85 | a |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-5. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 82 | b c | Benomyl | 85 | a |
| Chlorothalonil | 77 | d | Chlorothalonil | 85 | a |
| Triadimefon | 100 | a | Triadimefon | 85 | a |
| Bensulide | 82 | b c | Bensulide | 75 | b |
| DCPA | 80 | c | DCPA | 75 | b |
| Oxadiazon | 85 | b c | Oxadiazon | 75 | b |
| Check | 85 | b c | Check | 85 | a |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-6. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 77 | c d | Benomyl | 85 | a |
| Chlorothalonil | 82 | b c | Chlorothalonil | 75 | c |
| Triadimefon | 100 | a | Triadimefon | 85 | a |
| Bensulide | 75 | d | Bensulide | 75 | c |
| DCPA | 82 | b c | DCPA | 80 | b |
| Oxadiazon | 80 | b c d | Oxadiazon | 80 | b |
| Check | 75 | d | Check | 80 | b |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-7. Stand Density of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 75 | b | Benomyl | 85 | a |
| Chlorothalonil | 75 | b | Chlorothalonil | 85 | a |
| Triadimefon | 85 | a | Triadimefon | 85 | a |
| Bensulide | 75 | b | Bensulide | 85 | a |
| DCPA | 75 | b | DCPA | 85 | a |
| Oxadiazon | 75 | b | Oxadiazon | 85 | a |
| Check | 75 | b | Check | 85 | a |

[1]Percent live stand density.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-8. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 100 | a | Beno x Bens | 100 | a |
| Beno x DCPA | 100 | a | Beno x DCPA | 100 | a |
| Beno x Oxad | 100 | a | Beno x Oxad | 96 | b |
| Chlo x Bens | 100 | a | Chlo x Bens | 92 | c |
| Chlo x DCPA | 100 | a | Chlo x DCPA | 92 | c |
| Chlo x Oxad | 100 | a | Chlo x Oxad | 100 | a |
| Tria x Bens | 100 | a | Tria x Bens | 100 | a |
| Tria x DCPA | 100 | a | Tria x DCPA | 100 | a |
| Tria x Oxad | 100 | a | Tria x Oxad | 100 | a |
| Check | 100 | a | Check | 100 | a |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-9. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 85 | a | Beno x Bens | 96 | a |
| Beno x DCPA | 85 | a | Beno x DCPA | 85 | b |
| Beno x Oxad | 85 | a | Beno x Oxad | 87 | b |
| Chlo x Bens | 85 | a | Chlo x Bens | 85 | b |
| Chlo x DCPA | 85 | a | Chlo x DCPA | 85 | b |
| Chlo x Oxad | 85 | a | Chlo x Oxad | 85 | b |
| Tria x Bens | 85 | a | Tria x Bens | 100 | a |
| Tria x DCPA | 85 | a | Tria x DCPA | 100 | a |
| Tria x Oxad | 85 | a | Tria x Oxad | 100 | a |
| Check | 85 | a | Check | 82 | b |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-10. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 85 | a | Beno x Bens | 85 | a |
| Beno x DCPA | 85 | a | Beno x DCPA | 85 | a |
| Beno x Oxad | 85 | a | Beno x Oxad | 85 | a |
| Chlo x Bens | 85 | a | Chlo x Bens | 85 | a |
| Chlo x DCPA | 85 | a | Chlo x DCPA | 85 | a |
| Chlo x Oxad | 85 | a | Chlo x Oxad | 85 | a |
| Tria x Bens | 85 | a | Tria x Bens | 85 | a |
| Tria x DCPA | 85 | a | Tria x DCPA | 85 | a |
| Tria x Oxad | 85 | a | Tria x Oxad | 85 | a |
| Check | 80 | b c | Check | 85 | a |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-11. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 78 | b c | Beno x Bens | 85 | a |
| Beno x DCPA | 85 | a | Beno x DCPA | 85 | a |
| Beno x Oxad | 85 | a | Beno x Oxad | 85 | a |
| Chlo x Bens | 82 | a b | Chlo x Bens | 85 | a |
| Chlo x DCPA | 75 | c | Chlo x DCPA | 85 | a |
| Chlo x Oxad | 80 | a b | Chlo x Oxad | 85 | a |
| Tria x Bens | 85 | a | Tria x Bens | 85 | a |
| Tria x DCPA | 85 | a | Tria x DCPA | 85 | a |
| Tria x Oxad | 82 | a b | Tria x Oxad | 85 | a |
| Check | 85 | a | Check | 85 | a |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-12. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 100 | a | Beno x Bens | 75 | b |
| Beno x DCPA | 89 | b | Beno x DCPA | 75 | b |
| Beno x Oxad | 89 | b | Beno x Oxad | 75 | b |
| Chlo x Bens | 77 | d | Chlo x Bens | 75 | b |
| Chlo x DCPA | 80 | c | Chlo x DCPA | 75 | b |
| Chlo x Oxad | 80 | c | Chlo x Oxad | 75 | b |
| Tria x Bens | 100 | a | Tria x Bens | 85 | a |
| Tria x DCPA | 100 | a | Tria x DCPA | 85 | a |
| Tria x Oxad | 100 | a | Tria x Oxad | 75 | b |
| Check | 85 | b c | Check | 85 | a |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-13. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 75 | d | Beno x Bens | 85 | a |
| Beno x DCPA | 82 | b c | Beno x DCPA | 85 | a |
| Beno x Oxad | 80 | b c d | Beno x Oxad | 85 | a |
| Chlo x Bens | 82 | b c | Chlo x Bens | 75 | c |
| Chlo x DCPA | 82 | b c | Chlo x DCPA | 80 | b |
| Chlo x Oxad | 85 | b | Chlo x Oxad | 75 | c |
| Tria x Bens | 100 | a | Tria x Bens | 75 | c |
| Tria x DCPA | 100 | a | Tria x DCPA | 85 | a |
| Tria x Oxad | 100 | a | Tria x Oxad | 85 | a |
| Check | 75 | d | Check | 80 | b |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table D-14. Stand Density of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Percent Stand[1] | | | Percent Stand | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 75 | b | Beno x Bens | 75 | b |
| Beno x DCPA | 75 | b | Beno x DCPA | 75 | b |
| Beno x Oxad | 75 | b | Beno x Oxad | 75 | b |
| Chlo x Bens | 75 | b | Chlo x Bens | 85 | a |
| Chlo x DCPA | 75 | b | Chlo x DCPA | 85 | a |
| Chlo x Oxad | 75 | b | Chlo x Oxad | 85 | a |
| Tria x Bens | 85 | a | Tria x Bens | 85 | a |
| Tria x DCPA | 85 | a | Tria x DCPA | 85 | a |
| Tria x Oxad | 75 | b | Tria x Oxad | 85 | a |
| Check | 75 | b | Check | 85 | a |

[1]Percent live stand density.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

APPENDIX E

Table E-1. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | | High Nitrogen | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Quality Rating[1] | | | | | Quality Rating | | | |
| Chemicals | Means | DMR[2] | | | Chemicals | Means | DMR | | |
| Benomyl | 6.0 | a | | | Benomyl | 3.0 | | c | |
| Chlorothalonil | 6.0 | a | | | Chlorothalonil | 4.8 | b | | |
| Triadimefon | 4.0 | | b | | Triadimefon | 4.0 | b | | |
| Bensulide | 6.0 | a | | | Bensulide | 3.0 | | c | |
| DCPA | 6.0 | a | | | DCPA | 3.0 | | c | |
| Oxadiazon | 2.0 | | | c | Oxadiazon | 1.0 | | | d |
| Check | 6.0 | a | | | Check | 3.0 | | c | |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-2. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.8 | a b | Benomyl | 6.3 | a |
| Chlorothalonil | 5.8 | a b | Chlorothalonil | 6.0 | a |
| Triadimefon | 5.3 | a b | Triadimefon | 4.3 | b |
| Bensulide | 5.8 | a b | Bensulide | 6.0 | a |
| DCPA | 6.0 | a | DCPA | 6.0 | a |
| Oxadiazon | 1.0 | c | Oxadiazon | 1.0 | d |
| Check | 5.8 | a b | Check | 6.0 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-3. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.8 | b c | Benomyl | 6.0 | b |
| Chlorothalonil | 4.3 | c | Chlorothalonil | 7.0 | a |
| Triadimefon | 4.3 | c | Triadimefon | 5.0 | c |
| Bensulide | 5.0 | b | Bensulide | 7.0 | a |
| DCPA | 5.3 | a b | DCPA | 7.0 | a |
| Oxadiazon | 5.0 | b | Oxadiazon | 7.0 | a |
| Check | 5.8 | a | Check | 7.0 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-4. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.3 | a b | Benomyl | 6.0 | b |
| Chlorothalonil | 5.0 | a | Chlorothalonil | 6.3 | a |
| Triadimefon | 4.0 | b | Triadimefon | 5.0 | d |
| Bensulide | 4.3 | a b | Bensulide | 6.3 | a |
| DCPA | 4.5 | a b | DCPA | 5.8 | b c |
| Oxadiazon | 4.3 | a b | Oxadiazon | 6.3 | a |
| Check | 4.8 | a b | Check | 6.0 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-5. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.8 | a | Benomyl | 6.0 | a |
| Chlorothalonil | 4.3 | c | Chlorothalonil | 6.3 | a |
| Triadimefon | 5.0 | b c | Triadimefon | 5.5 | b |
| Bensulide | 5.0 | b c | Bensulide | 6.3 | a |
| DCPA | 5.5 | a b | DCPA | 5.3 | b c |
| Oxadiazon | 5.5 | a b | Oxadiazon | 6.0 | a |
| Check | 5.5 | a b | Check | 5.5 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-6. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 5.0 | a b | Benomyl | 4.5 | a |
| Chlorothalonil | 5.0 | a b | Chlorothalonil | 4.8 | a |
| Triadimefon | 5.5 | a | Triadimefon | 4.8 | a |
| Bensulide | 4.5 | b | Bensulide | 4.8 | a |
| DCPA | 5.0 | a b | DCPA | 5.0 | a |
| Oxadiazon | 4.8 | a b | Oxadiazon | 4.8 | a |
| Check | 3.3 | c | Check | 4.8 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-7. Quality Appearance of a Bentgrass Green as Influenced by Individual Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals | Means | DMR[2] | Chemicals | Means | DMR |
| Benomyl | 4.3 | b | Benomyl | 3.5 | b c |
| Chlorothalonil | 3.8 | b c | Chlorothalonil | 4.5 | a b |
| Triadimefon | 5.0 | a | Triadimefon | 5.0 | a |
| Bensulide | 3.8 | b c | Bensulide | 3.5 | b c |
| DCPA | 4.0 | b | DCPA | 4.0 | b |
| Oxadiazon | 4.0 | b | Oxadiazon | 4.0 | b |
| Check | 3.5 | c | Check | 3.8 | b c |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-8. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on April 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 6.0 | a | Beno x Bens | 4.0 | b |
| Beno x DCPA | 6.0 | a | Beno x DCPA | 3.0 | c |
| Beno x Oxad | 1.5 | c | Beno x Oxad | 1.0 | d |
| Chlo x Bens | 6.0 | a | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 6.0 | a | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 1.0 | c | Chlo x Oxad | 1.5 | d |
| Tria x Bens | 4.0 | b | Tria x Bens | 4.0 | b |
| Tria x DCPA | 4.0 | b | Tria x DCPA | 4.0 | b |
| Tria x Oxad | 2.0 | c | Tria x Oxad | 1.0 | d |
| Check | 6.0 | a | Check | 3.0 | c |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-9. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 12, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.3 | b | Beno x Bens | 6.0 | a |
| Beno x DCPA | 6.0 | a | Beno x DCPA | 6.0 | a |
| Beno x Oxad | 1.0 | c | Beno x Oxad | 1.0 | c |
| Chlo x Bens | 5.8 | a b | Chlo x Bens | 6.0 | a |
| Chlo x DCPA | 6.0 | a | Chlo x DCPA | 6.0 | a |
| Chlo x Oxad | 1.0 | c | Chlo x Oxad | 1.0 | c |
| Tria x Bens | 5.3 | b | Tria x Bens | 4.3 | b |
| Tria x DCPA | 5.3 | b | Tria x DCPA | 4.8 | b |
| Tria x Oxad | 1.0 | c | Tria x Oxad | 1.0 | c |
| Check | 5.8 | a b | Check | 6.0 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-10. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on May 26, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.5 | b c | Beno x Bens | 6.0 | b |
| Beno x DCPA | 4.8 | b c | Beno x DCPA | 6.0 | b |
| Beno x Oxad | 5.0 | b | Beno x Oxad | 6.0 | b |
| Chlo x Bens | 4.0 | c | Chlo x Bens | 7.0 | a |
| Chlo x DCPA | 4.0 | c | Chlo x DCPA | 7.0 | a |
| Chlo x Oxad | 5.0 | b | Chlo x Oxad | 7.0 | a |
| Tria x Bens | 5.0 | b | Tria x Bens | 5.0 | c |
| Tria x DCPA | 5.0 | b | Tria x DCPA | 5.0 | c |
| Tria x Oxad | 5.0 | b | Tria x Oxad | 5.0 | c |
| Check | 5.8 | a | Check | 7.0 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-11. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on June 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.3 | a b | Beno x Bens | 6.0 | b |
| Beno x DCPA | 4.8 | a b | Beno x DCPA | 6.3 | a |
| Beno x Oxad | 4.0 | b | Beno x Oxad | 5.0 | d |
| Chlo x Bens | 4.3 | a b | Chlo x Bens | 6.5 | a |
| Chlo x DCPA | 4.0 | b | Chlo x DCPA | 6.4 | a |
| Chlo x Oxad | 4.5 | a b | Chlo x Oxad | 5.0 | d |
| Tria x Bens | 4.0 | b | Tria x Bens | 5.0 | d |
| Tria x DCPA | 4.0 | b | Tria x DCPA | 5.0 | d |
| Tria x Oxad | 4.0 | b | Tria x Oxad | 5.0 | d |
| Check | 4.8 | a b | Check | 6.0 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-12. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 14, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 5.0 | b c | Beno x Bens | 5.5 | b |
| Beno x DCPA | 4.8 | c | Beno x DCPA | 5.8 | b |
| Beno x Oxad | 4.8 | c | Beno x Oxad | 5.8 | b |
| Chlo x Bens | 4.8 | c | Chlo x Bens | 4.3 | c |
| Chlo x DCPA | 4.3 | c | Chlo x DCPA | 4.8 | b c |
| Chlo x Oxad | 4.3 | c | Chlo x Oxad | 4.8 | b c |
| Tria x Bens | 5.0 | b c | Tria x Bens | 5.3 | b c |
| Tria x DCPA | 5.0 | b c | Tria x DCPA | 5.5 | b |
| Tria x Oxad | 5.0 | b c | Tria x Oxad | 5.0 | b c |
| Check | 5.5 | a b | Check | 5.5 | b |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-13. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on July 28, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 4.8 | a b | Beno x Bens | 4.3 | a b |
| Beno x DCPA | 4.8 | a b | Beno x DCPA | 4.0 | b |
| Beno x Oxad | 4.5 | b | Beno x Oxad | 4.3 | a b |
| Chlo x Bens | 4.8 | a b | Chlo x Bens | 2.0 | c |
| Chlo x DCPA | 4.5 | b | Chlo x DCPA | 4.3 | a b |
| Chlo x Oxad | 4.8 | a b | Chlo x Oxad | 4.0 | b |
| Tria x Bens | 5.0 | a b | Tria x Bens | 3.5 | b |
| Tria x DCPA | 5.3 | a | Tria x DCPA | 4.8 | a |
| Tria x Oxad | 5.5 | a | Tria x Oxad | 4.8 | a |
| Check | 3.3 | c | Check | 4.8 | a |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

Table E-14. Quality Appearance of a Bentgrass Green as Influenced by Interacting Effects of Fungicides and Herbicides Under Two N Levels on August 13, 1982.

| Low Nitrogen | | | High Nitrogen | | |
|---|---|---|---|---|---|
| | Quality Rating[1] | | | Quality Rating | |
| Chemicals[2] | Means | DMR[3] | Chemicals | Means | DMR |
| Beno x Bens | 3.5 | c | Beno x Bens | 3.8 | b c |
| Beno x DCPA | 3.8 | b c | Beno x DCPA | 2.8 | c |
| Beno x Oxad | 3.8 | b c | Beno x Oxad | 3.0 | c |
| Chlo x Bens | 1.8 | d | Chlo x Bens | 3.0 | c |
| Chlo x DCPA | 3.5 | c | Chlo x DCPA | 3.5 | b c |
| Chlo x Oxad | 4.0 | b | Chlo x Oxad | 4.3 | a b |
| Tria x Bens | 4.8 | a | Tria x Bens | 4.5 | a b |
| Tria x DCPA | 4.5 | a b | Tria x DCPA | 5.0 | a |
| Tria x Oxad | 4.8 | a | Tria x Oxad | 5.0 | a |
| Check | 3.5 | c | Check | 3.8 | b c |

[1]Quality appearance: 1 to 8; 1 = unacceptable, 8 = excellent.

[2]Chemical abbreviations: (See Tables 1 and 2).

[3]Means within columns and followed by a common letter are not significant at the 5 percent level of probability based on Duncan's Multiple Range (DMR) test.

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