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I am submitting herewith a thesis written by Charles Brandon Guy, Jr., entitled "Response of Selected Soybean Cultivars to Metribuzin." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Plant and Soil Science.

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RESPONSE OF SELECTED SOYBEAN CULTIVARS TO METRIBUZIN

A Thesis

Presented for the

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ABSTRACT

The purpose of this study was to determine the tolerance of several commercially grown soybean [Glycine max (L.) Merr.] cultivars to metribuzin under the same edaphic, climatic and cultural conditions. Twenty cultivars from maturity groups V and VI were studied in 1981 and 1982 at the University of Tennessee Plant Sciences Field Laboratory, Knoxville, Tennessee. Six cultivars were different in 1982.

The soil type was a Statler loam. The oxidizable organic matter in the A-horizon was 1.2%. The pH of this Statler loam was 5.8. Approximately 2.3 cm of rain fell within 3 days of planting and preemergence application of metribuzin in 1981. In 1982, 3.9 cm of rain fell within 2 days after planting and preemergence application of metribuzin.

A split-plot arrangement of treatments was used. The main-plots were metribuzin at rates of 0.56 and 1.12 kg/ha and an untreated check. The split-plots were the soybean cultivars. Data collected were plant stand, plant vigor and seed yield.

In general, of the 26 soybean cultivars studied, 'Coker 156', 'GS 737', 'Terra-vig 505' and 'Terra-vig 606' were most susceptible to metribuzin applied preemergence. The cultivars 'Agripro AP55', 'FFR 560', 'Peterson X5683' and 'Ringaround 502' had a lesser degree of susceptibility to metribuzin. Cultivars which had moderate tolerance to metribuzin were: 'Asgrow A5474', 'Bedford', 'Centennial', 'Coker 80-931', 'Deltapine 246', 'Deltapine 416', 'Deltapine 506',

'Essex', 'Forrest', 'McNair 600', 'Nathan', 'Pioneer 9561', 'Ringaround 481', 'Ringaround 604', 'Ringaround 680' and 'Walker'. Of the cultivars studied, 'Jeff' and 'Tracy-M' had the greatest degree of tolerance to metribuzin applied preemergence.

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CHAPTER I

INTRODUCTION

Soybean [Glycine max (L.) Merr.] production in Tennessee is limited by a number of factors such as soil fertility, insects, diseases and weeds. At present, one of the most important limiting factors is the control of large-seeded broadleaf weeds (34,35,44). Metribuzin [4-amino-6-tert-butyl-3(methylthio)-as-trazin-5(4H)-one] provides fair to good control of many of these problem weeds in addition to many small-seeded broadleaf weeds and certain annual grasses.

It has been noted by several researchers that soybean tolerance to metribuzin varies under different climatic, edaphic and cultural conditions (7,14,28,29,30,34,35). Also, it has been shown that under the same environmental conditions, different soybean cultivars vary in their tolerance to metribuzin (5,6,7,14,21,22,23,24,25,32, 33,37,46).

The 1982 label for "Lexone" (metribuzin) indicates that several cultivars are sensitive to Lexone (1). One cultivar listed on the label is 'Bedford'. This nematode resistant cultivar is commonly grown in West Tennessee where races 1, 3 and 4 of the soybean cyst nematode are a problem. Other soybean cultivars grown in Tennessee may also be sensitive to metribuzin.

The objective of this study was to determine the tolerance of 26 soybean cultivars from maturity groups V and VI to

metribuzin when grown under the same climatic, edaphic and cultural conditions.

CHAPTER II

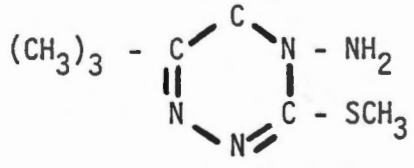
LITERATURE REVIEW

I. METRIBUZIN: GENERAL CHARACTERISTICS

Metribuzin [4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)-one] is an asymmetrical-triazine herbicide with properties similar to other diamino-s-triazine herbicides. Metribuzin was first introduced by Eve, Dickorè, Meiser and Westphal in 1969 (48). It was developed by Chemagro Agricultural Division, Mobay Chemical Corporation and E. I. duPont de Nemours and Company, Inc. (48). Metribuzin is presently included in the list of preplant incorporated, preemergence and directed postemergence herbicides recommended for weed control in soybeans in Tennessee (3).

Metribuzin is sold under the trade names of "Sencor" by Mobay Chemical Corporation and "Lexone" by E. I. duPont de Nemours and Company, Inc.

The molecular formula for metribuzin is $C_8H_{14}N_4OS$ (48). The structural formula for metribuzin is:



(48)

The pure chemical, metribuzin, is a solid white crystalline substance with a mild chemical odor (48). It has a molecular weight

of 214.3, a specific gravity of 1.28, a melting point between 125.5° and 126.5°C and a water solubility of 122 mg/100 g at 20°C (1220 ppm) (48). Barrentine et al. (5) indicate that a water solubility of 1220 ppm is much higher than the solubility of most herbicides.

Several researchers have found that metribuzin provides fair to good control of problem soybean weeds such as common cocklebur (Xanthium pensylvanicum Wallr.), morning glory (Ipomea spp.), sicklepod (Cassia obtusifolia L.) and hemp sesbania [Sesbania exaltata (Raf.) Cory] (7,34,35,44). Metribuzin is also effective against other broadleaf weeds such as prostrate pigweed [Amaranthus blitoides (S.) Wats.], redroot pigweed (Amaranthus retroflexus L.), smooth pigweed (Amaranthus hybridus L.), florida pusley (Richardia scabra L.), common ragweed (Ambrosia artemisiifolia L.), prickly sida (Sida spinosa L.), pennsylvania smartweed (Polygonum pennsylvanicum L.), velvetleaf (Abutilon theophrasti Medic.), spurred anoda [Anoda cristata (L.) Schlect.] and spotted spurge (Euphorbia maculata L.). Annual grasses controlled by metribuzin include large crabgrass [Digitaria sanguinalis (L.) Scop.], smooth crabgrass [Digitaria ischaemum (Schreb.) Mahl.], goosegrass [Elusine indica (L.) Gaertn.], giant foxtail (Setaria faberi Herrm.), green foxtail [Setaria viridis (L.) Beauv.], yellow foxtail [Setaria lutescens (Weigel) Hubb.], seedling johnsongrass [Sorghum halepense (L.) Pers.], fall panicum (Panicum dichotomiflorum Michx.) and broadleaf signalgrass [Brachiaria platyphylla (Griseb.) Nash.] (1,2).

Metribuzin can be applied preemergence, preplant incorprated and directed postemergence in soybeans (1,2,48). It is effective in

most annual crops at rates of 0.28 to 1.12 kg/ha (1,2,48). The usual carrier is water applied at volumes of 93.5 to 374.0 l/ha (48). The labels for both Sencor and Lexone indicate continuous agitation in the spray tank is required to insure a uniform spray mixture (1,2).

II. FACTORS AFFECTING SOYBEAN TOLERANCE TO METRIBUZIN

Cultural Practices

A number of cultural practices can influence the tolerance of soybeans to metribuzin. Many of these practices are within the control of the applicator. Factors such as calibration, boom height and boom overlap will not be discussed here. Other factors listed on the Lexone and Sencor labels will be mentioned briefly.

On both the Sencor and Lexone labels, the applicator is instructed that when metribuzin is applied preemergence, the soybean seed should be planted at least 3.8 cm deep or soybean injury may occur (1,2). Both labels also indicate that soil-applied organophosphate pesticides with metribuzin may result in injury. The Lexone label identifies several of these pesticides as Dasanit, Disyston, Mocap, Nemacur, Thimet, Parathion and Lorsban. Ladlie, et al. (30) showed that soybean injury may occur if atrazine was applied the year prior to metribuzin use.

Environmental Conditions

Several specific environmental factors affect the tolerance of soybeans to metribuzin. Two basic groups of macroenvironmental factors, soil and weather conditions, will be covered under this heading.

Metribuzin is absorbed through the roots by osmotic diffusion (48). It is translocated upward to the stem and leaves through the xylem (10,19,30,40,48). Metribuzin acts to inhibit photosynthesis (10,30,48) in the light reaction II (10).

In general, soil-applied herbicides enter plant roots as solutes with soil water. Metribuzin has a high water solubility (1220 ppm) (5). When considering the phytotoxicity of metribuzin to soybeans, it is important to understand that the degree of adsorption to soil colloids modifies the availability of the herbicide to the soil solution (15). Soil factors that affect the adsorption of metribuzin include soil type, amount and type of soil organic matter and the soil pH (14,16,28,29,43,48).

It is common that soils with a high amount of organic matter and/or clay content require increased herbicide rates to achieve acceptable weed control. This holds true for metribuzin and is evident by the recommended rates given on both the Sencor and Lexone labels for soybeans (1,2). Both labels indicate that metribuzin should not be used on coarse textured, sandy loam or loamy sand soils with less than 2.0% organic matter. On medium textured soils, loam, silt loam, silt, sandy clay and sandy clay loam with 0.5-2.0% organic matter, 0.42 kg/ha of metribuzin is recommended. On fine textured soils, silty clay, silty clay loam and clay loam with 0.5-2.0% organic matter, 0.56 kg/ha of metribuzin is recommended. On heavy textured soils, silty clay to heavy clay with 0.5-2.0% organic matter, 0.84 kg/ha of metribuzin is recommended. As organic matter increases, higher rates of metribuzin are recommended for all soil types.

Several studies have compared the toxicity of s-triazines in various soil types and have shown a high degree of influence of soil type (13,36,45). These studies indicate that the amount and type of organic matter and clay are most important.

Talbert and Fletchall (43) reported that the organic exchangers were more adsorptive for s-triazines than the clay exchangers. Peat moss had a higher adsorptive capacity than did Wisconsin peat.

Coble and Schrader (14) observed severe injury to soybeans from metribuzin treated soil having 1.1% organic matter at herbicide rates of 0.56-1.68 kg/ha. The tolerance increased with an increase in soil organic matter, and no injury occurred at 16.8 or 50% organic matter.

The adsorption of s-triazines by organic matter and clay is attributed to the protonation of the basic molecule (4,43). The extent and nature of adsorption of basic organic compounds in the soil colloidal system is probably most affected by surface acidity of the soil system (4).

Talbert and Fletchall (43) found that both simazine and atrazine were not adsorbed by kaolinite. It was also reported that illite and montmorillonite adsorbed these compounds similarly. It was postulated by the authors that perhaps the triazines were not able to penetrate the internal surfaces of the expanding lattice of the montmorillonite clay.

Many studies have shown less phytotoxicity of s-triazine herbicides under acid soil conditions (8,9,29,43). It has been determined that the adsorption of s-triazines is dependent on the pH

of the soil system. The reduction of s-triazine in the soil solution resulting from the adsorption to soil colloids means that less herbicide is available to plant roots (47).

Corbin and Upchurch (16) reported that the soil pH may directly influence the activity of herbicides by affecting the ionic or molecular character of the chemical, the ionic character of soil colloids and the cation exchange capacity.

Ladlie et al. (29) determined that the pH of the soil system affects the availability of metribuzin for plant absorption. These researchers also observed that as the pH decreased, the adsorption of metribuzin to the soil colloidal system increased. It was also reported that the adsorption of metribuzin at low pH values was attributed to cation exchange and to the hydrogen bonding of the protonated metribuzin molecule with ions on the soil colloidal surface.

Hyzak and Zimdahl (26) observed that the half-life of metribuzin was 16 days at 35°C and 44 days at 20°C in an air-dried San Luis sandy soil. It was determined that the loss of metribuzin was linear with time at both temperatures.

Metribuzin is only slightly volatile and the loss due to volatilization is not significant under field conditions (48). Loss due to photodecomposition is also not significant under field conditions (48).

Kaufman and Kearney (27) reported that most soil detoxification of chloro-s-triazines is probably the result of chemical hydrolysis.

It was also determined that the major method of soil detoxification of methylthio-s-triazines is dependent on microbial action (27,48).

Ladlie et al. (28) found a high correlation (r = 0.993) between percent ^{14}C evolved as $^{14}CO_2$ and soil pH. These researchers determined that as the soil pH increased, microbial degradation also increased. This was attributed to the greater availability of metribuzin to the soil solution at high pH values (28).

Several researchers have reported that soybean injury increased if excessive rainfall followed metribuzin application (7,14,34,35). Barrentine and McWhorter (7) reported that soybean injury was severe if areas treated with metribuzin received standing water after application.

Soybean Cultivars

Cultivar differences in response to herbicides have been reported for several crops. Soybean cultivar response to several herbicides has been shown to vary among cultivars (11,38). Many researchers have reported differences among soybean cultivars in tolerance to metribuzin (5,6,7,14,21,22,23,24,25,32,33,37,46).

In a study conducted by Smith and Wilkinson (37), the physiological basis for intraspecific variability in soybean tolerance to metribuzin was investigated. These researchers studied the differential tolerance of one tolerant and two sensitive soybean cultivars by analyzing the absorption, translocation, distribution and metabolism of ^{14}C-metribuzin. They determined that metribuzin was readily absorbed by the root system and translocated to the stem

of both the sensitive and tolerant cultivars. It was shown that less metribuzin was found in the leaflets of the tolerant cultivar than in the leaflets of the two sensitive cultivars. It was postulated that these differences were due to the differential ability of the roots and stems of the cultivars studied to metabolize and detoxify metribuzin. The authors indicated that the roots, stems and leaves of the three cultivars were able to deaminate metribuzin forming a deaminated diketo metabolite. Similar quantities of the deaminated diketo metabolite were found in all three cultivars. It was also determined that greater quantities of a glucose conjugated metabolite of either metribuzin or its catabolites were found in the tolerant cultivar. Smith and Wilkinson (37) concluded that the differential response of soybean cultivars to metribuzin is physiologically due to the formation of greater quantities of a non-phytotoxic N-glucoside of metribuzin by tolerant cultivars. The formation of a N-glucosyl complex as a method of herbicide detoxification has been reported by other researchers (39,41,42).

In a study conducted by Edwards et al. (17), the inheritance of metribuzin sensitivity of the soybean cultivar 'Semmes' was determined. These researchers crossed tolerant 'Hood' with sensitive 'Semmes'. The F_2 generation of this cross fit a 3:1 segregation ratio. A second test with 27 backcross families was conducted. Fifteen families displayed tolerance and the 12 families that displayed sensitivity segregated again to a 3:1 ratio. The ratio of non-segregating families to segregating families fit a 1:1 ratio

(15:12). These results led the authors to conclude that a single recessive gene controls metribuzin sensitivity.

CHAPTER III

MATERIALS AND METHODS

This study was conducted in 1981 and 1982 at the University of Tennessee Plant Sciences Field Laboratory, Knoxville, Tennessee. The soil type was a Statler loam. The pH of this Statler loam was 5.8. The oxidizable organic matter found in the A-horizon was 1.2% and in the B-horizon was 0.5%. The texture determination by the pipette method indicated that the A-horizon was 34.2% sand, 18.9% coarse silt, 31.0% silt and 15.8% clay. The B-horizon was 18.1% sand, 20.6% coarse silt, 32.3% silt and 19.1% clay. The recommended rate of metribuzin is less for soils of relatively low organic matter and light texture.

In both 1981 and 1982 the seedbed was prepared by plowing in the spring. After disk incorporation of fertilizer, the seedbed was smoothed with a spike-tooth harrow. Fertilizer was applied at the rate of 67.2 kg of P_2O_5 and K_2O per hectare. No nitrogen fertilizer was applied.

Each soybean cultivar was planted at a rate of 240 seeds/6.1 m with a manual cone planter on June 29, 1981 and on June 10, 1982. Each plot contained three rows planted 0.914 m apart. Metribuzin was applied preemergence at rates of 0.56 kg/ha and 1.12 kg/ha on June 30, 1981 and on June 10, 1982 with a hand-held CO_2 sprayer delivering 187 l/ha of diluted spray at 2.1 kg/cm^2.

The cultivars from maturity group V that were studied included: 'Agripro AP55', 'Asgrow A5474', 'Bedford', 'Essex',

'FFR 560', 'Forrest', 'Nathan', 'Peterson X5683', 'Pioneer 9561', 'Ringaround 481', 'Ringaround 502', 'Terra-vig 505' and 'Walker'. The cultivars from maturity group VI that were studied included: 'Centennial', 'Coker 156', 'Coker 80-931', 'Deltapine 246', 'Deltapine 416', 'Deltapine 506', 'GS 737', 'Jeff', 'McNair 600', 'Ringaround 604', Ringaround 680', 'Terra-vig 606' and 'Tracy-M'.

This experiment was arranged in a split-plot order with a randomized complete block design. The main treatments were metribuzin at 0.56 kg/ha, 1.12 kg/ha and a non-herbicide treated check. The split treatments were the cultivars. Treatments were replicated four times in 2.74 x 6.10 meter plots. Blocks were separated by 0.610 meter alleys. All plots were maintained weed-free by cultivation and hand-hoeing throughout the growing season.

Approximately 2.3 cm of rain fell within 3 days after planting and application of metribuzin in 1981. In 1982, 3.9 cm of rain fell within 2 days after planting and application of metribuzin. Weather data are given in Appendix Tables A-1 and A-2.

Visual ratings of vigor reduction were made 10 and 17 days after planting in 1981. In 1982 these ratings were made 12, 26 and 47 days after planting. The visual rating scale of 0 to 100 was used to denote vigor reduction. A rating of 0 denoted no effect, 1-10 denoted a very slight effect, 11-35 denoted a slight effect, 36-65 denoted a moderate effect and 66-100 denoted a severe effect.

Plant population was determined by counting the plants per 2.29 m of the center row in 1981. In 1982, a visual rating of stand reduction was made on July 27. A scale of 0-100 was used to

denote stand reduction. A rating of 0 was used to denote no effect, 1-10 denoted a very slight effect, 11-35 denoted a slight effect, 36-65 denoted a moderate effect and 66-100 denoted a severe effect.

Yield data were obtained from a 4.88 m section of the center row. The plots were harvested manually and threshed with a small plot thresher. Seed yield was recorded and moisture determinations were made the same day of weighing. In 1981, soybeans from both maturity groups V and VI were harvested in November. In 1982, soybeans from maturity group V were harvested on November 11 and soybeans from maturity group VI were harvested on December 2.

The field studies for maturity groups V and VI for both 1981 and 1982 were analyzed separately. Then appropriate tests combining the cultivars that occurred both years within each maturity group were made. The first of the combined tests was to test the effect of the year on cultivar response to metribuzin at all rates. The mean seed yields for each cultivar at each metribuzin rate were separated using Duncan's Multiple Range Test (20).

Tests to determine the significance of the main-plot and split-plot (metribuzin rate and cultivar) interaction for the dependent variables, population and yield, were made separately for both maturity groups within each year. Because of significant main-plot and split-plot interactions, mean separation for the dependent variables were performed on the interaction means (18). Separation of the interaction means using Dancan's Multiple Range Test (20)

required adjusting the error mean square. This was accomplished by the use of the following formula (18).

$$S_{\bar{X}} = \sqrt{\frac{(\text{Number of cultivars} - 1 \times \text{Error b}) + \text{Error a}}{\text{Number of replications} \times \text{Number of cultivars}}}$$

CHAPTER IV

RESULTS AND DISCUSSION

The effect of the year was not significant in maturity group V at $P \leq 0.05$. It was also found that the difference between years in maturity group VI was significant at $P \leq 0.05$. For each dependent variable studied, significant interactions among soybean cultivars and metribuzin rates were found at $P \leq 0.05$.

Separation of the seed yield interaction means for maturity group VI was not as powerful as the separation of the interaction means for maturity group V. This was due in part to a higher coefficient of variation for the dependent variable, seed yield, in maturity group VI when compared to maturity group V.

I. RESPONSE OF 13 SOYBEAN CULTIVARS FROM MATURITY GROUP V TO METRIBUZIN

'Agripro AP55'

Both rates of metribuzin reduced plant stands of 'Agripro AP55' when compared to the untreated check (Tables 1 and 2). For example, the plant stands were 39, 32 and 14 plants/m in 1981 on plots treated with the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). Stand reductions in 1982 were 0, 5 and 59% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). In addition, both rates of metribuzin caused visual vigor reduction compared to the control of 'Agripro AP55'. The vigor differences were most apparent at the earliest ratings

Table 1. The effects of two rates of metribuzin on seed yield, plant stand and vigor of 10 soybean cultivars from maturity group V grown at Knoxville, TN, 1981.

Soybean Cultivar	Metribuzin Rate	Seed Yield		Vigor Reduction Days After Application 10	17	Plant Stand	
	----------kg/ha----------			----------%----------		-Plants/lm-	
Agripro AP55	0	2784	a[†]	0[‡]	0	39	c-d[†]
	0.56	2569	a-c	3	1	32	e
	1.12	2404	a-e	29	19	14	n
Asgrow A5474	0	2246	b-f	0	0	33	e
	0.56	2599	a-b	0	0	32	e
	1.12	2199	b-g	8	5	26	f-g
Bedford	0	1702	g	0	0	54	a
	0.56	1984	d-g	0	0	52	a-b
	1.12	2040	c-g	13	5	50	b
Essex	0	2453	a-e	0	0	21	j-l
	0.56	2572	a-c	0	1	19	k-m
	1.12	2211	b-g	23	26	15	m-n
Forrest	0	2048	c-g	0	0	25	f-i
	0.56	2495	a-d	1	3	23	h-g
	1.12	2236	b-f	25	29	17	l-n
Nathan	0	2466	a-e	0	0	22	i-k
	0.56	2218	c-g	6	5	18	k-m
	1.12	2144	c-g	39	25	17	l-n
Peterson X5683	0	1994	b-f	0	0	36	d
	0.56	2236	b-g	1	1	32	e
	1.12	2213	d-g	15	20	23	g-j
RA 481	0	2307	a-f	0	0	28	f
	0.56	2219	b-g	0	1	28	f
	1.12	2325	a-f	24	13	18	l-n
Terra-vig 505	0	2436	a-e	0	0	42	c
	0.56	2391	a-e	24	15	19	k-m
	1.12	942	h	97	97	1	o
Walker	0	1823	f-g	0	0	24	f-h
	0.56	1945	e-g	0	0	26	g-j
	1.12	1962	d-g	25	29	21	j-l

[†]Values within the same column which are followed by the same letter are not significantly different at the 5% level of significance according to Duncan's Multiple Range Test.

[‡]0 = none; 1-10 = very slight; 11-35 = slight; 36-65 = moderate; 66-100 = severe.

Table 2. The effects of two rates of metribuzin on seed yield, plant stand and vigor of 10 soybean cultivars from maturity group V grown at Knoxville, TN, 1982.

Soybean Cultivar	Metribuzin Rate	Seed Yield		Vigor Reduction Days After Application 12	26	47	Stand Reduction
	kg/ha			%			
Agripro AP55	0	2630	a-c†	0‡	0	0	0‡
	0.56	2585	a-d	15	13	1	5
	1.12	1834	e-g	75	80	44	59
Asgrow A5474	0	2875	a	0	0	0	0
	0.56	2675	a-b	3	1	1	0
	1.12	2392	a-f	61	48	29	40
Bedford	0	2242	a-g	0	0	0	0
	0.56	2292	a-g	11	12	1	10
	1.12	1706	g-h	81	13	30	56
Essex	0	2312	a-g	0	0	0	0
	0.56	2419	a-g	1	4	0	0
	1.12	2010	c-h	47	47	10	27
FFR 560	0	2591	a-d	0	0	0	0
	0.56	2531	a-d	3	7	0	1
	1.12	1808	f-h	68	55	18	47
Forrest	0	2457	a-e	0	0	0	0
	0.56	2507	a-d	5	6	0	1
	1.12	2030	c-h	68	47	25	45
Nathan	0	2073	d-h	0	0	0	0
	0.56	2284	a-g	6	2	0	1
	1.12	1623	h	64	50	28	41
Pioneer 9561	0	2283	a-g	0	0	0	0
	0.56	2453	a-e	8	4	2	8
	1.12	1809	f-h	66	48	20	39
RA 502	0	2635	a-c	0	0	0	0
	0.56	2624	a-c	4	4	0	3
	1.12	1981	d-h	48	44	25	38
Terra-vig 505	0	2383	a-f	0	0	0	0
	0.56	1019	i	93	95	82	78
	1.12	137	j	98	98	99	98

†Values with the same column which are followed by the same letter are not significantly different at the 5% level of significance, according to Duncan's Multiple Range Test.

‡0 = none; 1-10 = very slight; 11-35 = slight; 36-65 = moderate; 66-100 = severe.

(10 or 12 days after application) and became less apparent as time progressed (Tables 1 and 2). For example, in 1982 the vigor ratings were 15% at 12 days, 13% at 26 days and essentially none at 47 days after application of 0.56 kg/ha metribuzin. Vigor reduction ratings for the 1.12 kg/ha rate were 75% at 12 days, 80% at 26 days and 44% at 47 days after application (Table 2). In 1981, the seed yields of 'Agripro AP55' obtained from plots treated with either metribuzin rate were not significantly different ($P \leq 0.05$) from the untreated check (Table 1). In 1982, only the 1.12 kg/ha rate decreased seed yield significantly ($P \leq 0.05$) when compared to the untreated check, 1823 versus 2630 kg/ha, respectively (Table 2). Mean seed yield data for 1981 and 1982 are included in Table 3.

'Asgrow A5474'

Only the 1.12 kg/ha rate of metribuzin reduced plant stands of 'Asgrow A5474' when compared to the untreated check (Tables 1 and 2). For example, the plant stands were 33, 32 and 26 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). In 1982, the 1.12 kg/ha rate caused a 40% stand reduction when compared to the untreated check (Table 2). In both 1981 and 1982, the recommended rate (0.05 kg/ha) of metribuzin caused essentially no visual vigor reductions (Tables 1 and 2). Only in 1982 was appreciable visual vigor reduction noticed at the 1.12 kg/ha rate when compared to the untreated check, 40 versus 0%, respectively. The visual vigor reductions at the 1.12 kg/ha rate in 1982 became less apparent as time progressed (Table 2). In both 1981 and 1982, the

Table 3. The effects of two rates of metribuzin on seed yield of seven soybean cultivars from maturity group V grown at Knoxville, TN, 1981 and 1982.

Cultivar	Metribuzin Rate	Seed Yield†	
	----------kg/ha----------		
Agripro AP55	0	2707	a‡
	0.56	2577	a-b
	1.12	2119	b-e
Asgrow A5474	0	2561	a-b
	0.56	2637	a
	1.12	2296	a-d
Bedford	0	1972	c-e
	0.56	2138	b-e
	1.12	1873	d-e
Essex	0	2382	a-c
	0.56	2495	a-b
	1.12	2110	b-e
Forrest	0	2252	a-d
	0.56	2501	a-b
	1.12	2133	b-e
Nathan	0	2270	a-d
	0.56	2251	a-d
	1.12	1883	d-e
Terra-vig 505	0	2410	a-c
	0.56	1705	e
	1.12	540	f

†Mean seed yield for 1981 and 1982.

‡Values within the same column which are followed by the same letter are not significantly different at the 5% level of significance, according to Duncan's Multiple Range Test.

seed yields of 'Asgrow A5474' from plots treated with either metribuzin rate were not significantly ($P \leq 0.05$) different when compared to the untreated check (Tables 1, 2 and 3).

'Bedford'

Only the 1.12 kg/ha rate of metribuzin appreciably reduced the plant stand of 'Bedford' compared to the untreated check (Tables 1 and 2). For example, the plant stands were 54, 52 and 50 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). In 1982 the stand reductions were 0, 10 and 56% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). Only in 1982 did the 0.56 kg/ha rate cause a visual vigor reduction and this was slight. As time after treatment progressed, this vigor reduction became less apparent (Table 2). In 1982, the 1.12 kg/ha rate caused a visual vigor reduction of 81% at the earliest (12 days after application) rating. By 47 days after application, the vigor reduction of 'Bedford' had decreased to 30% at the 1.12 kg/ha rate (Table 2). Neither metribuzin rate significantly ($P \leq 0.05$) reduced the seed yield of 'Bedford' in either 1981 or 1982 when compared to the untreated check (Tables 1, 2 and 3).

'Essex'

Only the 1.12 kg/ha rate of metribuzin appreciably reduced the plant stand of 'Essex' compared to the untreated check (Tables 1 and 2). For example, the plant stands were 21, 19 and 15 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). The stand reductions in 1982 were 0, 0 and 27% for the 0, 0.56 and

1.12 kg/ha rates, respectively (Table 2). In addition, the recommended (0.56 kg/ha) rate of metribuzin caused essentially no visual vigor reductions in either 1981 or 1982 (Tables 1 and 2). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Essex' in either year (Tables 1, 2 and 3).

'FFR 560'

Data were collected for 'FFR 560' only in 1982. Only the 1.12 kg/ha rate of metribuzin reduced plant stand when compared to the untreated check. For example, stand reduction on plots treated with the 0, 0.56 and 1.12 kg/ha rates were 0, 1 and 47%, respectively (Table 2). In addition, only the 1.12 kg/ha rate caused appreciable visual vigor reduction when compared to the control of 'FFR 560'. Vigor reductions were 0, 3 and 68% 12 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). Only the 1.12 kg/ha rate significantly ($P \leq 0.05$) reduced the seed yield of 'FFR 560' when compared to the untreated check, 1808 versus 2591 kg/ha, respectively (Table 2).

'Forrest'

Only the 1.12 kg/ha rate of metribuzin caused reductions in plant stands of 'Forrest' when compared to the untreated check (Tables 1 and 2). For example, the plant stands were 25, 23 and 17 plants/m in 1981 for the 0.56 and 1.12 kg/ha rates, respectively (Table 1). The stand reductions in 1982 were 0, 1 and 45% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). In both 1981 and 1982 the recommended rate (0.56 kg/ha) of metribuzin caused

essentially no visual vigor reductions. The 1.12 kg/ha rate caused visugal vigor reductions both years (Tables 1 and 2). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Forrest' both years (Tables 1, 2 and 3).

'Nathan'

Only the 1.12 kg/ha rate of metribuzin caused reductions in plant stands of 'Nathan' compared to the untreated check (Tables 1 and 2). For example, the plant stands were 22, 18 and 17 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). The stand reductions in 1982 were 0, 1 and 41% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). In addition, only the 1.12 kg/ha rate caused appreciable visual vigor reductions. The vigor differences were most apparent at the earliest (10 and 12 days after application) ratings and became less apparent as time progressed. For example, in 1982 the vigor ratings were 64% at 12 days, 50% at 26 days and 28% at 47 days after application of 1.12 kg/ha metribuzin (Tables 1 and 2). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Nathan' compared to the untreated check (Tables 1, 2 and 3).

'Peterson X5683'

Data were collected for 'Peterson X5683' only in 1981. Both rates of metribuzin caused significant ($P \leq 0.05$) stand reductions compared to the untreated check (Table 1). The stand reductions were 36, 32 and 23 plants/m for the 0, 0.56 and 1.12 kg/ha rates, respectively. This trend was not reflected in the visual vigor

reductions for the 0.56 and 1.12 kg/ha rates when compared to the untreated check, 1, 20 and 0% 17 days after application, respectively. In addition, the seed yield of 'Peterson X5683' was not significantly ($P \leq 0.05$) reduced at either rate compared to the untreated check (Table 1).

'Pioneer 9561'

Data were collected for 'Pioneer 9561' only in 1982. The recommended rate (0.56 kg/ha) of metribuzin did not cause appreciable stand or vigor reductions of 'Pioneer 9561' compared to the untreated check. The 1.12 kg/ha rate did cause visual vigor and stand reductions. For example, the stand reductions were 0, 8 and 39% for the 0, 0.56 and 1.12 kg/ha rates, respectively. In addition, neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Pioneer 9561' compared to the untreated check (Table 2).

'Ringaround 481'

Data were collected for 'Ringaround 481' only in 1981. Only the 1.12 kg/ha rate caused a significant ($P \leq 0.05$) reduction in plant stand compared to the untreated check, 18 versus 28 plants/m, respectively. In addition, only the 1.12 kg/ha rate resulted in visual vigor reductions compared to the untreated check, 24 versus 0% 12 days after application, respectively. Although plant stand and vigor reductions were noticed at the 1.12 kg/ha rate, neither rate significantly ($P \leq 0.05$) reduced the seed yield of 'Ringaround 481' compared to the untreated check (Table 1).

'Ringaround 502'

Data were collected for 'Ringaround 502' only in 1982. Only the 1.12 kg/ha rate of metribuzin resulted in appreciable stand and vigor reductions compared to the untreated check. For example, stand reductions were 0, 3 and 38% for the 0, 0.56 and 1.12 kg/ha rates, respectively. Also, vigor reductions were 0, 4 and 58% 12 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively. The vigor differences were most apparent at the earliest rating and became less apparent as time progressed, 45% at 12 days, 44% at 26 days and 25% at 47 days after application of 1.12 kg/ha metribuzin. In addition, only the 1.12 kg/ha rate significantly ($P \leq 0.05$) reduced the seed yield of 'Ringaround 502' compared to the untreated check, 1981 versus 2635 kg/ha, respectively (Table 2, p. 18).

'Terra-vig 505'

Both rates of metribuzin severely reduced the plant stands of 'Terra-vig 505' compared to the untreated check (Tables 1 and 2, pp. 17 and 18). For example, the plant stands were 42, 19 and 1 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). In 1982 the stand reductions were 0, 78 and 98% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 2). In addition, both rates resulted in vigor reductions compared to the control of 'Terra-vig 505' (Tables 1 and 2). The vigor reductions in 1981 were 0, 24 and 97% 10 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 1). The vigor reductions in 1982 were 0, 93 and 98% 12 days after application for the 0, 0.56 and

1.12 kg/ha rates, respectively (Table 2, p. 18). In 1981, only the 1.12 kg/ha rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Terra-vig 505' when compared to the untreated check, 942 versus 2436 kg/ha, respectively (Table 1, p. 17). In 1982, both rates significantly ($P \leq 0.05$) reduced the seed yield of 'Terra-vig 505' compared to the untreated check. The seed yields were 2383, 1019 and 137 kg/ha for the 0, 0.56 and 1.12 kg/ha rates of metribuzin, respectively (Table 2). Mean seed yield data for 1981 and 1982 are included in Table 3 (p. 20).

'Walker'

Data were collected for 'Walker' only in 1981. Only the 1.12 kg/ha rate of metribuzin resulted in appreciable vigor and stand reductions compared to the control of 'Walker'. For example, the plant stands were 24, 26 and 21 for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although the 1.12 kg/ha rate resulted in vigor and stand reductions, neither rate significantly ($P \leq 0.05$) reduced the seed yield of 'Walker' when compared to the untreated check (Table 1).

II. RESPONSE OF 13 SOYBEAN CULTIVARS FROM MATURITY GROUP VI TO METRIBUZIN

'Centennial'

Only the 1.12 kg/ha rate of metribuzin reduced the plant stand of 'Centennial' compared to the untreated check (Tables 4 and 5). For example, plant stands were 36, 34 and 22 plants/m in 1981

Table 4. The effects of two rates of metribuzin on seed yield, plant stand and vigor of 10 soybean cultivars from maturity group VI grown at Knoxville, TN, 1981.

Soybean Cultivar	Metribuzin Rate	Seed Yield		Vigor Reduction Days After Application 10	17	Plant Stand	
	kg/ha			%		-Plants/1m-	
Centennial	0	1761	a-b†	0‡	0	36	a-c†
	0.56	1851	a-b	5	1	34	a-c
	1.12	1833	a-b	44	50	22	e-g
Coker 156	0	2171	a-b	0	0	41	a
	0.56	1892	a-b	58	73	8	i-k
	1.12	244	d	97	99	0	k
Deltapine 246	0	1998	a-b	0	0	36	a-c
	0.56	1875	a-b	1	0	34	a-d
	1.12	1502	b	31	43	23	d-g
Deltapine 416	0	1925	a-b	0	0	37	a-b
	0.56	1860	a-b	0	0	32	a-e
	1.12	1725	a-b	25	29	30	c-f
Deltapine 506	0	2218	a	0	0	34	a-d
	0.56	2137	a-b	1	1	38	a-b
	1.12	2083	a-b	26	16	34	a-d
GS 737	0	1816	a-b	0	0	26	c-f
	0.56	1645	a-b	53	57	11	h-j
	1.12	874	c	96	99	2	j-k
Jeff	0	1922	a-b	0	0	31	a-e
	0.56	1787	a-b	8	0	36	a-c
	1.12	1662	a-b	14	3	37	a-c
McNair 600	0	2050	a-b	0	0	34	a-c
	0.56	2152	a-b	6	9	35	a-c
	1.12	1737	a-b	44	73	21	f-h
RA 680	0	2003	a-b	0	0	32	a-e
	0.56	2216	a	5	4	35	a-c
	1.12	1906	a-b	41	40	34	a-c
Terra-vig 606	0	2132	a-b	0	0	32	a-e
	0.56	1677	a-b	54	58	14	g-i
	1.12	390	c-d	98	99	1	j-k

†Values within the same column which are followed by the same letter are not significantly different at the 5% level of significance, according to Duncan's Multiple Range Test.

‡0 = none; 1-10 = very slight; 11-35 = slight; 36-65 = moderate; 66-100 = severe.

Table 5. The effects of two rates of metribuzin on seed yield, plant stand and vigor of 10 soybean cultivars from maturity group VI grown at Knoxville, TN, 1982.

Soybean Cultivar	Metribuzin Rate	Seed Yield		Vigor Reduction Days After Application 12	26	47	Stand Reduction
	kg/ha			%			
Centennial	0	3194	a†	0‡	0	0	0‡
	0.56	3250	a	2	6	0	0
	1.12	2952	a-b	40	34	9	28
Coker 156	0	2876	a-b	0	0	0	0
	0.56	2043	b	78	85	65	48
	1.12	115	c	97	99	99	99
Coker 80-931	0	2703	a-b	0	0	0	0
	0.56	2378	a-b	3	11	0	5
	1.12	2581	a-b	63	69	15	36
Deltapine 246	0	2047	b	0	0	0	0
	0.56	3054	a-b	6	6	3	4
	1.12	2691	a-b	54	54	13	33
Deltapine 506	0	3049	a-b	0	0	0	0
	0.56	2758	a-b	3	3	0	0
	1.12	2672	a-b	40	31	10	16
Jeff	0	2811	a-b	0	0	0	0
	0.56	2910	a-b	2	1	0	0
	1.12	2537	a-b	34	18	6	9
McNair 600	0	2713	a-b	0	0	0	0
	0.56	3352	a	1	8	5	3
	1.12	2862	a-b	34	48	9	41
RA 604	0	2997	a-b	0	0	0	0
	0.56	2818	a-b	2	3	0	0
	1.12	2605	a-b	41	31	6	15
Terra-vig 606	0	3290	a	0	0	0	0
	0.56	2395	a-b	66	63	36	34
	1.12	164	c	97	99	99	98
Tracy-M	0	3205	a	0	0	0	0
	0.56	2281	a-b	0	4	0	0
	1.12	2617	a-b	20	18	8	18

†Values within the same column which are followed by the same letter are not significantly different at the 5% level of significance, according to Duncan's Multiple Range Test.

‡0 = none; 1-10 = very slight; 11-35 = slight; 36-65 = moderate; 66-100 = severe.

for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 4). The stand reductions in 1982 were 0, 0 and 28% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). In addition, the recommended rate (0.56 kg/ha) of metribuzin resulted in essentially no visual vigor reductions in both 1981 and 1982. An appreciable vigor reduction was noticed at the 1.12 kg/ha rate when compared to the control of 'Centennial' (Tables 4 and 5). For example, the vigor reductions in 1982 at 12 days after application were 0, 2 and 40% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Centennial' when compared to the untreated check (Tables 4 and 5).

'Coker 156'

Both rates of metribuzin caused reductions in plant stands of 'Coker 156' compared to the untreated check (Tables 4 and 5). For example, plant stands were 41, 8 and 0 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 4). The stand reductions in 1982 were 0, 48 and 99% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). In addition, both rates caused visual vigor reductions compared to the control of 'Coker 156' (Tables 4 and 5). For example, in 1982 the vigor reductions at 12 days after application were 0, 78 and 98% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Although both rates of metribuzin resulted in vigor and stand reductions, only the 1.12 kg/ha rate significantly ($P \leq 0.05$) reduced the seed yield of 'Coker 156' compared to the

untreated check, 244 versus 2171 in 1981 and 115 versus 2876 in 1982, respectively (Tables 4 and 5).

'Coker 80-931'

Data were collected for 'Coker 80-931' only in 1982. Only the 1.12 kg/ha rate resulted in appreciable plant stand and vigor reductions compared to the untreated check. For example, plant stand reductions were 0, 5 and 36% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Although the 1.12 kg/ha rate caused vigor and stand reductions, neither rate significantly ($P \leq 0.05$) reduced the seed yield compared to the untreated check (Table 5).

'Deltapine 246'

Only the 1.12 kg/ha rate of metribuzin caused vigor and stand reductions of 'Deltapine 246' when compared to the untreated check (Tables 4 and 5). For example, plant stands were 36, 34 and 23 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 4). The plant stand reductions in 1982 were 0, 4 and 33% for the 0, 0.56 and 1.12 kg/ha rates, respectively. The vigor reductions in 1982 were 0, 6 and 54% 12 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Deltapine 246' when compared to the untreated check (Tables 4 and 5).

'Deltapine 416'

Data were collected for 'Deltapine 416' only in 1981. Only the 1.12 kg/ha rate of metribuzin resulted in reductions in plant

stands and vigor compared to the untreated check. For example, plant stands were 37, 32 and 30 plants/m for the 0, 0.56 and 1.12 kg/ha rates, respectively. Visual vigor reductions were 0, 0 and 25% 10 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although visual vigor and stand reductions were apparent at the 1.12 kg/ha rate, neither rate significantly ($P \leq 0.05$) reduced the seed yield of 'Deltapine 416' when compared to the untreated check (Table 3).

'Deltapine 506'

Neither rate of metribuzin appreciably reduced plant stands of 'Deltapine 506' compared to the untreated check (Tables 4 and 5). Visual vigor reductions were apparent at only the 1.12 kg/ha rate of metribuzin. For example, visual vigor reductions in 1982 were 0, 3 and 40% 12 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Deltapine 506' compared to the untreated check (Tables 4 and 5).

'GS 737'

Data were collected for 'GS 737' only in 1981. Both rates of metribuzin caused significant ($P \leq 0.05$) stand reductions when compared to the untreated check. For example, the plant stands were 26, 11 and 2 plants/m for the 0, 0.56 and 1.12 kg/ha rates, respectively. In addition, both rates caused visual vigor reductions of 0, 53 and 96% 10 days after application for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although both rates reduced plant stand and vigor,

only the 1.12 kg/ha rate significantly ($P \leq 0.05$) reduced the seed yield of 'GS 737' when compared to the untreated check (Table 4).

'Jeff'

Neither rate of metribuzin caused appreciable reductions in plant stands of 'Jeff' compared to the untreated check. In addition, visual vigor reductions were apparent at only the 1.12 kg/ha rate when compared to the untreated check (Tables 4 and 5). This vigor reduction decreased as time progressed. For example, in 1982 the vigor ratings were 34% at 12 days, 18% at 26 days and 6% at 47 days after application of 1.12 kg/ha of metribuzin (Table 5). Neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'Jeff' when compared to the untreated check (Tables 4 and 5).

'McNair 600'

Only the 1.12 kg/ha rate of metribuzin resulted in stand reductions of 'McNair 600' compared to the untreated check (Tables 4 and 5). For example, plant stands were 34, 35 and 21 plants/m in 1981 for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 4). In addition, only the 1.12 kg/ha rate caused appreciable visual vigor reductions when compared to the untreated check 41 versus 0% 12 days after application, respectively (Table 5). Although the 1.12 kg/ha rate caused vigor and stand reductions, neither rate of metribuzin significantly ($P \leq 0.05$) reduced the seed yield of 'McNair 600' when compared to the untreated check (Tables 4 and 5).

'Ringaround 604'

Data were collected for 'Ringaround 604' only in 1982. Only the 1.12 kg/ha rate of metribuzin caused reductions in plant stand and vigor compared to the untreated check. For example, plant stand reductions were 0, 0 and 15% for the 0, 0.56 and 1.12 kg/ha rates, respectively. In addition, the visual vigor reductions 12 days after application were 0, 2 and 41% for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although the 1.12 kg/ha rate resulted in stand and vigor reductions, neither rate significantly ($P \leq 0.05$) reduced the seed yield of 'Ringaround 604' compared to the untreated check (Table 5).

'Ringaround 680'

Data were collected for 'Ringaround 680' only in 1981. Neither rate of metribuzin significantly ($P \leq 0.05$) reduced plant stands. Only the 1.12 kg/ha rate resulted in appreciable visual vigor reductions compared to the untreated check. For example, vigor ratings 10 days after application were 0, 5 and 41% for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although the 1.12 kg/ha rate reduced the vigor of 'Ringaround 680', neither rate significantly ($P \leq 0.05$) reduced seed yield when compared to the untreated check (Table 4).

'Terra-vig 606'

Both rates of metribuzin caused reductions in plant stands of 'Terra-vig 606' compared to the untreated check (Tables 4 and 5). For example, plant stands were 32, 14 and 1 plants/m in 1981 for

the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 4, p. 27). The stand reductions in 1982 were 0, 33 and 98% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5, p. 28). In addition, both rates caused visual vigor reductions compared to the untreated check (Tables 4 and 5). For example, in 1982 the vigor reductions 12 days after application were 0, 66 and 97% for the 0, 0.56 and 1.12 kg/ha rates, respectively (Table 5). Although both rates of metribuzin resulted in vigor and stand reductions, only the 1.12 kg/ha rate significantly ($P \leq 0.05$) reduced the seed yield of 'Terra-vig 606' compared to the untreated check, 390 versus 2132 in 1981 and 164 versus 3290 in 1982, respectively (Tables 4 and 5).

'Tracy-M'

Data were collected for 'Tracy-M' only in 1982. Only the 1.12 kg/ha rate of metribuzin resulted in stand and vigor reductions compared to the untreated check. For example, plant stand reductions were 0, 0 and 18% for the 0, 0.56 and 1.12 kg/ha rates, respectively. In addition, vigor reductions 12 days after application were 0, 0 and 20% for the 0, 0.56 and 1.12 kg/ha rates, respectively. Although the 1.12 kg/ha rate caused stand and vigor reductions, neither rate significantly ($P \leq 0.05$) reduced the seed yield of 'Tracy-M' compared to the untreated check (Table 5).

CHAPTER V

SUMMARY AND CONCLUSIONS

Twenty-six soybean cultivars were evaluated for seed yield, plant stand and vigor following preemergence treatment with a single (0.56 kg/ha) or double (1.12 kg/ha) recommended rate of metribuzin. The study was conducted for 2 years on a Statler loam with 1.2% organic matter and a pH of 5.8. In 1981 the single rate of metribuzin did not result in a significant ($P \leq 0.05$) yield reduction of any of the cultivars compared to their corresponding untreated check. In 1982 only 'Terra-vig 505' had a significant ($P \leq 0.05$) yield reduction at the 0.56 kg/ha rate. In 1981 the cultivars 'Coker 156', 'GS 737', 'Terra-vig 505', and 'Terra-vig 606' had significant ($P \leq 0.05$) reductions in yield at the 1.12 kg/ha rate. In 1982 the cultivars 'Agripro AP55', 'Coker 156', 'FFR 560', 'Ringaround 502', 'Terra-vig 505' and 'Terra-vig 606' had significant ($P \leq 0.05$) yield reductions at the 1.12 kg/ha rate.

For plant stand reductions in 1981, only 'Agripro AP55', 'Coker 156', 'GS 737', 'Peterson X5683', 'Terra-vig 505' and 'Terra-vig 606' were significantly ($P \leq 0.05$) reduced at the 0.56 kg/ha rate of metribuzin. The cultivars 'Agripro AP55', 'Asgrow A5474', 'Bedford', 'Centennial', 'Coker 156', 'Deltapine 246', 'Deltapine 416', 'Essex', 'Forrest', "GS 737', 'McNair 600', 'Nathan', 'Peterson X5683', 'Ringaround 481', 'Terra-vig 505', 'Terra-vig 606' and

'Walker' were significantly ($P \leq 0.05$) reduced at the 1.12 kg/ha rate when compared to the untreated check. Only 'Terra-vig 505' responded with a severe stand reduction at the 0.56 kg/ha rate in 1982. At the 1.12 kg/ha rate of metribuzin, the cultivars 'Coker 156', 'Terra-vig 505' and 'Terra-vig 606' had severe stand reductions in 1982.

The recommended rate (0.56 kg/ha) caused severe vigor reductions of cultivars 'Coker 156', 'GS 737', 'Terra-vig 505' and 'Terra-vig 606'. Cultivars that had moderate to severe vigor reductions at the 1.12 kg/ha rate of metribuzin were 'Agripro AP55', 'Asgrow A5475', 'Bedford', 'Centennial', 'Coker 156', 'Coker 80-931', 'Deltapine 246', 'Deltapine 506', 'Essex', 'Forrest', 'FFR 560', GS 737', 'McNair 600', 'Nathan', 'Pioneer 9561', 'Ringaround 502', 'Ringaround 604', 'Ringaround 680', 'Terra-vig 505' and 'Terra-vig 506'.

Even though many of the cultivars had significant ($P \leq 0.05$) stand reductions, they did not show significant ($P \leq 0.05$) yield reductions when compared to the untreated check. This was probably due to the soybean plants' ability to compensate for spacing differences between individual plants. As spacing increases, soybean plants tend to have greater numbers of pods, seeds and branches per plant (12,31).

In general, 'Coker 156', 'GS 737', 'Terra-vig 505' and 'Terra-vig 606' were most susceptible to metribuzin applied preemergence. The cultivars 'Agripro AP55', 'FFR 560', 'Peterson X5683' and 'Ringaround 502' had a lesser degree of susceptibility to metribuzin.

Cultivars which had a moderate tolerance to metribuzin were 'Asgrow A5474', 'Bedford', 'Centennial', 'Coker 80-931', 'Deltapine 246', 'Deltapine 416', 'Deltapine 506', 'Essex', 'Forrest', 'McNair 600', 'Nathan', 'Pioneer 9561', 'Ringaround 481', 'Ringaround 604', 'Ringaround 680' and 'Walker'. Of the cultivars studied, 'Jeff' and 'Tracy-M' had the greatest degree of tolerance to metribuzin applied preemergence.

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APPENDIX

Table A-1. Rainfall data, 1981, University of Tennessee Plant Sciences Field Laboratory, Knoxville, TN.

Day	June	July	August
1	.64†	1.07	
2	1.55	1.24	1.83
3	1.02		.13
4	1.07	.23	
5	.43		
6	5.61	.51	
7	3.25	.81	1.45
8	.71		.84
9			
10			
11	1.14		
12	.30		.23
13			
14			
15		.08	
16		.03	.05
17		.30	
18			
19		.84	.03
20			
21		1.02	3.48
22			
23	1.88		
24			
25		.10	
26	1.27		
27			
28			
29		.18	
30			.05
31			

†Rainfall recorded in centimeters.

Table A-2. Rainfall data, 1982, University of Tennessee Plant Sciences Field Laboratory, Knoxville, TN.

Day	June	July	August
1	.13†		
2			
3		2.79	
4	.33		.20
5			
6			
7			.91
8		5.23	4.55
9			1.35
10	.71	2.46	
11		.25	
12	3.15		
13			
14			
15			
16	1.63		.05
17			7.32
18		.15	
19		.89	
20			
21	.43		
22		.30	
23			1.32
24		.10	.18
25			
26	.66		
27	.56	3.71	.61
28	.05	.28	
29	.28	2.84	
30		7.87	.43
31			.33

†Rainfall recorded in centimeters.

VITA

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