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Effect of Different Concentrations of Imazaquin on Performance of Soybean *(Glycine max*).

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Abstract

An experiment was conducted in order to examine the effect of different concentrations of Imazaquin applied as both pre and post emergence treatments on soybean plants. Soybean variety TGX 17402X was used in this experiment. Results obtained revealed that efficacy of Imazaquin varies according to concentration and time of application. Adequate weed control was achieved in all the concentrations of Imazaquin with the best in concentration 0.375 kg a i./ha applied as pre emergence and all the concentrations applied as post emergence at 4 WAP (Weeks after planting) ,0.250 and 0.375 kg a i./ha at 12 WAP. Stem height was best at higher concentration of 0.375 kg, a i./ha (45.00cm) at 8WAP while at 12 WAP, pre emergence concentration 0.250 kg. a i./ha and post emergence 0.375kg.ai./ha also produced best stem heights of 67.00 and 68.00cm respectively. Leaf number was highest in the control experiment with 50 leaves at 8 WAP followed by post emergence concentration of 0.375 and 0.250 kg.a i./ha with 46.00 and 45.00 which were not statistically significant. However, the control, pre emergence treatments of concentrations 0.125 and 0.375 kg. a i./ha, and the post emergence concentration of 0.375 kg. a i./ha were significantly higher than the rest at 9 WAP (61,60,58 and 57 respectively). At 12WAP, concentrations of 0.125 and 0.250kg. a i./ha at post and pre emergence application produced significantly higher number of leaves than the remaining treatments. Weed emergence was significantly higher in the control experiment at 4, 8, 9 and 12WAP.

Key words: *Glycine max*, Imazaquin, Concentrations, pre emergence, post emergence

Introduction

Soybean (*Glycine max L*. Merril) belongs to the family *Fabacae*. It is a very important staple food crop in East Asia. Soybean is ranked high among the leguminous crops in its nutritional value owing to its high content of oil, carbohydrate, protein, minerals and fibres (Kochhar, 1981; Yayock, 1988). Utilization of soybean in Africa is quite recent, basically because soybean is not indigenous to Africa. Weeds interfere with the production of soybean worldwide especially the production areas of forest transition and Guinea savanna ecologies of Nigeria (Ayeni and Oyekan, 1992). Considerable losses due to weed alone have been reported worldwide. Almost half of the potential food yield is lost annually in less developed areas of Africa. Losses caused by uncontrolled weed growth in soybean in Nigeria, Ghana and Zaire were estimated to be 60%, 55% and 40% Respectively (Akobundu,

1980).

The traditional method of hand weeding employed by farmers in Nigeria is often insufficient in the control of weeds. This makes the use of herbicide a preferable alternative (Akobundu, 1987). Imazaquin, an Imidazolinone herbicide, has been variously reported to be useful as chemical control agent in legumes (Akobundu, 1987; Shanner and O'Cornor, 1991). The aim of this study was to investigate the responses of soybean to Imazaquin concentrations.

Materials and methods

This experiment was carried out in an open space within the premises of the Department of Plant Biology, University of Ilorin, Ilorin, Nigeria. Twenty four polythene bags of height 28cm and 25cm width were filled with organic matter rich loamy soil leaving about 5cm from the top of the bags unfilled to prevent water run-off and washing away of the soil nutrient. All the soil filled poly bags were watered and perforated to prevent water logging before planted with 5 seeds each of TGX 1740 2X variety of soybean (*Glycine max*) the following day. This variety of soybean was collected from the International Institute of Tropical Agriculture (IITA) Ibadan, Nigeria. All the 24 poly bags were properly labelled and arranged in a randomized block design. Nine bags were sprayed with Imazaquin as pre emergence application the second day after plating while other nine bags were sprayed as early post-emergence application 16 days after planting. The remaining six bags were not sprayed with herbicide and these served as control experiments for both pre and post-emergence treatments. In each of the treatments, hand sprayer was used to spray three concentrations of Imazaquin 0.125, 0.250 and 0.375kg a.i./ha on the soil either as pre or post-emergence. Each of the concentrations was replicated three times and the control as well. The experiments were watered regularly when there was no rain. Various parameters were taken which include germination and seedling establishment, weed emergence, plant stem height, leaf number, flower and pod formation, pod number per plant, pod weight per plant, seed number per plant, seed weight per plant and shoot dry weight after harvest.

The results were statistically analyzed using analysis of variance (ANOVA) and the means were separated using Duncan's multiple range test (DMRT).

Results and discussion

Seed germination was observed in all the treatments at the end of eight days after planting. Percentage seed emergence and seedling establishment at 3WAP are shown in Table 1. Soybean stem heights at 8, 9 and 12WAP showed significant differences among the various herbicide concentrations and time of application. Higher concentration of 0.375 kg a. i/ha applied as pre and post emergence produced the tallest stem height of 45.00cm this was followed by the control experiment with 43.00cm at 8WAP, while concentration 0.250 kg a. i /ha pre emergence and 0.375 kg a.i/ha as post emergence produced tallest stem height of 48cm at 9WAP each. This was followed by the control experiment 47.00 cm while concentration 0.375 kg a. i/ha post and 0.250 kg a.i/ha pre emergence produced the tallest stem height of 68.00 and 67.00cm respectively followed by the control experiment 65.00 cm at 12WAP (Table 2).

Leaf number was highest in the control experiment 50.00cm at 8WAP followed by 46.00 and 45.00cm at post emergence concentrations of 0.375 and 0.250 kg a i/ha which were significantly lower than the pre emergence application treatment. Control, pre emergence treatments of concentration of 0.375 kg a i/ha, with post emergence concentration of 0.375 kg a i/ha were significantly higher than the rest treatments at 9WAP (61, 60, 58 and 57) respectively (Table 3). Leaf number at 12WAP at concentration 0.125 kg a.i/ha of post emergence and the pre-emergence application of 0.125 kg ai/ha were significantly higher than the rest treatments (Table 3). Weed emergence was significantly higher in the control experiment at 4, 8, 9 and 12WAP (Table 4). Post emergence application of the herbicide at 2 WAP killed the emerged weeds and rendered the pots weed-free up to 4WAP (Table 4) however, there was a re-emergence at 8, 9 and 12WAP though significantly lower than the pre emergence treatments at 9 and 12WAP (Table 4)

Flowering was not affected by Imazaquin except in the pre emergence application concentration of 0.125 kg a i/ha where only 33.3% of the plants flowered at 6WAP. Other concentrations both at pre and post emergence were at par with the control having 100% of the plants flowering at 6WAP except at concentration 0.375 kg a i/ha pre and post emergence having 67% of its plants flowering (Table 5). There were no pod formation at 9WAP in all the treatments except in the post emergence treatment of 0.250kg a i/ha where 100% of the plants have produced pods and the control 33.3% (Table 5). In general, pod formation was significantly higher in post emergence treatment concentrations of 0.250 and 0.375 kg a.i/ha and pre emergence treatment concentration of 0.375 kg a i/ha have 100% of their plants producing pods at 10WAP, this was followed by the control experiment 83% (Table 5).

Generally, pod number and seed number per plant were enhanced by both at pre and post emergence treatments of Imazaquin. Pod weight was significantly reduced in the pre emergence concentration of 0.125 kg a i ha and post emergence concentrations 0.250 and 0.375 kg a i /ha. These were at par with the control treatment. Seed weight was significantly reduced in the pre emergence herbicide treatment of 0.125 kg a i /ha (Table 6).

The hazards arising from weed interference in crop production system may result in both the reduction in yield and the quality of the yield which invariably lead to loss of income to farmers (Mortimer, 1984, Norton and Conway, 1977). Imazaquin is an Imidazolinone herbicide widely used in weed control among legume crops. High Soybean germination and seedling establishment in this work is an indication that Imazaquin does not inhibit germination processes as well as seedling development. This is in agreement with the earlier findings of Adesina *et al.*1998, Olorunmaiye and Onifade. (2001); Olorunmaiye *et al* (2003), Fadayomi and Olofintoye, (2005), and Olorunmaiye (2008)

Re-emergence of weeds in the treatments pointed to the fact that re-application of herbicide may be necessary for adequate weed suppression and a season long weed control. This agrees with the reports of Adesina *et al*.(1998) and Olorunmaiye,(2008) who observed re-influx of weeds in plots 6 weeks after Imazaquin application. Stem height was enhanced significantly at higher concentration of 0.375 kg a i /ha both at pre and post emergence application of Imazaquin. Leaf number was equally enhanced by Imazaquin concentrations both as pre and post emergence application at 12WAP.

Generally pod and seed production were promoted by the use of Imazaquin herbicide. Reproductive parameters like pod number per plant, seed weight, Seed Number and seed weight per plant and shoot dry weight were all significantly enhanced in all the treatments (Table 6).

Table 1. Effect of Imazaquin concentration on percentage seedling emergence and establishment at 3WAP*

Concentrations (kg.a i./ha)	Mean % seedling emergence and Establishment
Control	33.30c
Pre 0.125	38.30c
0.250	50.00b
0.375	88.67a

	Post 0.125	50.00b
	0.250	33.30c
	0.375	33.30c

Means carrying the same letter along the same column are not significantly different at P≥ 0.05.

*WAP=Weeks after planting

Table 2. Effects of Imazaquin concentrations on soybean stem height.

Concentration(kg.ai./ha)		Mean stem height (cm)		
		8WAP*	9WAP	12WAP
Control		43.00a	47.00a	65.00a
Pre	0.125	35.00b	41.00b	64.00a
	0.250	35.00b	48.00a	67.00a
	0.375	45.00a	44.00ab	58.00b
Post	0.125	40.00ab	45.00a	63.00a
	0.250	35.00b	42.00b	46.00c
	0.375	45.00a	48.00a	68.00a

Means carrying the same letter along the same column are not significantly different at P≥ 0.05

*WAP=Weeks after planting

Table 3. Effects of Imazaquin concentrations on the leaf number of soybean.

Concentration(kg. ai./ha)		Mean leaf number/Plant.		
		8WAP*	9WAP	12WAP
Control		50.00a	61.00a	66.00b
Pre	0.125	36.00b	60.00a	76.00a
	0.250	38.00b	55.00b	76.00a
	0.375	35.00b	58.00a	65.00b
Post	0.125	40.00b	55.00b	80.00a

0.250	45.00a	46.00c	57.00b
0.375	46.00a	57.00a	63.00b

Means carrying the same letter(s) along the same column are not significantly different at P≥ 0.05

*WAP=Weeks after planting

Table 4. Effects of Imazaquin concentration on weed emergence.

Concentration(kg. Ai./ha	Mean weed emergence			
	4WAP*	8WAP	9WAP	12WAP
Control	7.00a	10.00a	9.00a	7.00a
Pre 0.125	4.00b	5.00b	5.00b	5.00ab
0.250	3.00b	3.00b	3.00bc	3.00bc
0.375	1.00c	3.00b	3.00bc	3.00bc
Post 0.125	0.00d	5.00b	4.00bc	4.00c
0.250	0.00d	3.00b	2.00c	2.00c
0.375	0.00d	3.00b	2.00c	2.00c

Means carrying the same letter(s) along the same column are not significantly different at P≥ 0.05

*WAP=Weeks after planting

Table 5. Effects of Imazaquin concentration on time flowering and pod formation.

Concentrations(kg.ai /ha)	% Flowering	Pod formation	
	6WAP*	9WAP	10WAP
Control	100.00a	33.30b	83.50b
Pre 0.125	33.30c	0.00c	33.30d
0.250	100.00a	0.00c	0.00e
0.375	67.00b	0.00c	100.00a
Post 0.125	100.00a	0.00c	67.00c
0.250	100.00a	100.00a	100.00a
0.375	67.00b	0.00c	100.00a

Means carrying the same letter(s) along the same column are not significantly different at P≥ 0.05

*WAP=Weeks after planting

Table 6. Effects of Imazaquin concentrations on Soybean yield components.

Conc.(kg.ai/ha)		PodNo/plt	Podwt/plt.(g)	Seed No/plt.	Seed wt/plt(g)	Dryshootwt/plt
Control		16.00bc	2.20f	32.00b	3.00b	2.60bc
Pre	0.125	17.00abc	206e	28.00bc	1.70d	4.20a
	0.250	18.00ab	4.60b	37.00a	3.20ab	2.90b
	0.375	15.00bc	3.60c	31.00b	2.90b	2.80b
Post	0.125	20.00a	5.30a	37.00a	3.40a	3.70a
	0.250	15.00bc	3.10d	26.00c	2.50c	1.50d
	0.375	14.00c	3.10d	30.00bc	2.00d	2.10c

Means carrying the same letter(s) along the same column are not significantly different at P≥ 0.05

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