EFFECT OF PRE EMERGENCE HERBICIDES ON WEED CONTROL AND PERFORMANCE OF COWPEA IN SAMARU

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ABSTRACT

Field experiments were carried out in 2010 and 2011 cropping seasons at the Institute for Agricultural Research, Ahmadu Bello University, Zaria- Nigeria located on latitude11⁰11', longitude7⁰38' and 686m above sea level in Northern Guinea Savannah Ecological Zone to evaluate the effect of pre emergence herbicides on growth and yield parameters of cowpea. In this study, different pre emergence herbicides were compared for their efficiency on weed control of various weed species under rain- fed conditions in Nigeria. The different herbicides used are, S-metolachlor 960 EC @ the rate of 3.5 litre ha^{-1}, pendimenthaline 33% (w/v) EC @ the rate of 3.5 liter ha^{-1} and Butalachlor E.C at the rate of 3.5Lha^{-1}. There was significant yield increase due to Application of pendimenthaline at 3.5 L ha^{-1} + Hand weeding of cowpea at 6WAS. There was significantly superior performances in terms of plant height, number of leaves per plant, number of branches per plant, number of pods per plant and grain yield ha^{1}. However Leaf area per plant and 100 – grain weight were not significantly influenced by the treatments. Of all the weed control methods, chemical weed control using pendimenthaline at 3.5 L ha^{-1} + Hand weeding at 6WAS, significantly gave better results than the other treatments on both growth and yield parameters.

Key words: cowpea, herbicides, weed control methods.

INTRODUCTION

Cowpea (*Vigna unguiculata* L. Walp) grown in rainy season, is usually infested by quite a number of weed species that compete with the crop right from germination to harvest, affecting the crop yield adversely (Patel *et al*., 2003). Therefore, in order to enhance crop yield and its effects on soil fertility, control of weeds during this period is very important. The traditional methods of weed control such as hand pulling, hand hoeing and harrowing are very expensive and labour is usually not very available during the peak periods of weed removal from the field (Khan *et al*., 2000). However, the use of herbicides to control weeds in cowpea grown fields appears to be the only available option (Dadari, 2003). Though most of these herbicides are weed specific, but some to a greater extent, are more effective in controlling weeds than the other traditional ones mentioned above. Weeds are very important in reducing crop yields by lowering input efficiency, serving as hideouts for insect- pests and disease-pathogens, contaminating harvests as debris

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and some exhibiting alleleophatic Properties against crops. Yield losses in cowpea due to weeds were 12.7 - 60.0% (Li *et al.*, 2004). The phenomenon involved in crop yield increases as influenced by different weed control methods have already been well described Patel *et al.*, (2003). Muhammad *et al.*, (2003) reported that the presence of weeds in cowpea, reduced yield by 82% and a significant increase in yield of pods was noted by controlling weeds up to 45 days of sowing. Parasuraman (2000) found that application of pendimenthalin (1.5 - 2.0 L ha^{-1} or fluchloralin (1.0 - 1.5 L ha^{-1}) at 3 DAP + hand weeding twice at 30 DAP resulted in a significant reduction in weed population, weed dry matter and an increase in cowpea yield under rain-fed conditions. Patel *et al.*, (2003) conducted a field experiment to evaluate weed management strategy for cowpea, a Pre- emergence application of pendimenthalin at 0.75 kg a. i. ha^{-1} + weeding at 5 weeks after planting significantly gave higher grain yield of 511 kg ha^{-1} and net return of ($ 4,705 ha^{-1}) compared to other treatments. According to Muhammad *et al.*, (2003) the best post- emergence herbicide for the control of weeds in cowpea is phenoxaprop-p-ethyl at the rate of 80gm ha^{-1} + glyphosate at 1,800 gm ha^{-1} and was observed to be more effective against grasses. Jaibir (2004) reported that pendimenthalin at 1.0 kg ha^{-1} + hand weeding at 30 days after planting significantly gave a higher cowpea grain yield, weed density and biomass was lowest in this treatment. The postulation that integrated weed management can be useful to provide better weed control measures should further be assessed. Keeping these facts in view, a comprehensive study should be designed to integrate different weed control methods in rain- fed cowpea crop. This study was therefore designed to evaluate the different pre emergence weed control methods with a view to recommend the appropriate control measure that would give an optimum yield of cowpea with minimal hoe weeding.

MATERIALS AND METHODS

Two field experiments were conducted under rain- fed conditions for two cropping seasons in 2010 and 2011 respectively; at the Teaching and Research Farm of the Institute for Agricultural Research Ahmadu Bello University, Zaria located on latitude 11^{0}11' N, longitude 7^{0}38'Eand 686m above sea level in the Northern Guinea Savannah Ecological Zone of Nigeria. The experiment was laid out in a randomized complete block design (RCBD), consisting of four treatments; the control, S-metolachlor 960 EC @ the rate of 3.5 litre ha^{-1}, pendimenthaline 33% (w/v) EC @ the rate of 3.5 liter ha^{-1} and Butalachlor E.C at the rate of 3.5Lha-^{1}. Herbicides were applied a day after planting. Spraying was done with a knapsack sprayer fitted with a T-jet nozzle. In addition to the pre emergence control hoe weeding was carried out at 6 WAS for all the treatments. The variety of cowpea used was IAR 48; which was sown on 6th July, 2010 and 11th July, 2011 respectively at three seeds per hole which was later thinned to two seedlings per hole during the first weeding three weeks after planting at inter and intra – row spacing of 50cm and 25cm respectively. All other agronomic practices except those under study were kept normal and uniform for all the treatments. Standard procedures were adopted in recording data for both growth and yield parameters. Species of weed population were counted from one m^2 in each plot. The counted weeds were cut from ground surface, stored in containers and brought to the laboratory for biomass assessment. They were dried in the oven until constant weight was achieved. Other parameters recorded included; Plant height (cm), number of leaves per plant, number of branches per plant, leaf area (cm^2), number of pods per plant, number of seeds per pod, 100 - grain weight (gm) and grain yield (t ha^{-1}).

RESULTS AND DISCUSSION

Growth Parameters

Plant height (cm), number of leaves per plant, number of branches per plant and leaf area (cm²)

From Table 01, it could be observed that there was a significant difference among the mean values of treatments due to the different pre-emergence herbicides used in both 2010 and 2011 cropping seasons at P = 0.05. The use of pendimenthaline significantly gave higher mean values on plant height, number of leaves/plant and number of branches/plant at P = 0.05 in both seasons. However, the control treatment significantly gave lower mean values at P = 0.05 on the same parameters. This observation is in line with the work of Parasuraman (2000) who earlier reported that pre - emergence application of pendimenthalin at 1.5 L ha⁻¹ or 2.0 Lha⁻¹ at 3 DAP + hand weeding at 30 DAP, significantly gave higher growth parameters of plant height, number of leaves/plant and number of branches/plant by reducing weed population and weed dry matter in cowpea grown fields. There was no significant difference among the treatments on leaf area. Though pendimenthaline gave higher mean values than the other treatments but they were not significantly different at P = 0.05.

Number of pods per plant, pod yield per plot and grain yield ha⁻¹

Table 01 show the significant differences in number of pods/plant, number of seeds/pod and grain yield ha⁻¹ in both 2010 and 2011 cropping seasons due to application of different pre emergence herbicides. Pendimenthaline significantly gave higher mean values of number of pods/plant, number of seeds/pod and grain yield ha⁻¹ at P = 0.05. 100 – Grain weight was not significantly affected by treatments at P = 0.05. The control treatment gave lower mean values, while the use of pendimenthaline gave higher mean values but they were not significantly different at P = 0.05. This observation is in line with the work of Patel *et al.,* (2003) who earlier reported that application of pendimenthaline at 3.75 L ha⁻¹ + hand weeding at 5 weeks after sowing significantly gave higher mean values on yield and yield components of cowpea. Also, the net return was estimated to be ($4,705).

Weed density m²

Table 02 shows a significant difference at P = 0.05 on weed density due to different types of pre emergence herbicides applied. The control treatment significantly gave higher mean values than the rest of the treatments. On the other hand pendimenthaline significantly gave lower mean values of weed density than the rest treatments. This means that a combination of weed control methods involving the chemical control + hand weeding significantly controlled weed population in all plots under this treatment. This observation is in agreement with works of Patel *et al.,* (2003). Who earlier reported that the presence of weeds reduced yield by 82 % and significant yield increase in pod was noted by controlling weeds up to45 days of sowing. Also, Dadari (2003) earlier reported that the use of herbicides in cowpea to control weeds appears to be useful and considered to be more effective against weeds.

Table 01: Growth and Yield of Cowpea as Influenced by Pre emergence Herbicides at Samaru in 2010 and 2011 Cropping Seasons

Treatments	Plant height (cm)		Number of leaves per plant		Number of branches per plant		Leaf area (cm²)		Number of pods per plant		Pod yield per plot (kg)		Pod yield per ha⁻¹ (t)	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Control	42.80c	43.74c	7.45d	8.14c	3.42b	3.44b	35.48a	36.00a	5.20bc	4.78bc	1.24b	1.32b	1234.10c	1233.90c
S-Metolachlor	48.13b	49.35b	10.34c	11.10c	5.14a	4.87ab	38.53a	38.57a	6.10b	6.25b	1.68b	1.70b	2345.60b	2338.58b
Butalachlor	52.84a	53.24a	13.30b	14.25b	8.10a	4.77ab	39.42a	38.96a	7.36a	7.44a	2.45ab	2.52ab	2495.40b	2508.68b
Pendimenthal-ine	55.05a	55.48a	15.10a	16.18a	8.30a	7.95a	41.15a	40.15a	8.35a	9.08a	2.78a	3.16a	3210.10a	3218.14a

Means with the same letter (s) within a column are not significantly different at P = 0.05 Duncan's Multiple Range Test (DMRT).

Table 02: Density per (m²) of Weed Species in Cowpea as Influenced by Pre emergence Herbicides at Samaru, Zaria in 2010 and 2011 at 3 WAS

Treatments	Cynodon dactylon		Echinochloa colona		Cyperus rotundus		Ageratum conyzoides		Eleusine indica	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Control	80.10a	82.40a	48.45a	44.13a	29.42a	26.74a	14.22a	13.80a	14.08a	14.11a
S-Metolachlor	24.30b	24.25b	28.22b	20.32d	18.10b	23.87b	07.42b	06.38c	09.14b	10.11b
Butalachlor	25.47b	19.14d	27.18b	28.45c	15.40c	15.56c	08.12b	08.22b	06.88c	07.23c
Pendimenthaline	26.42b	22.48c	22.40c	39.18b	14.30c	13.45d	07.39b	06.78c	08.23b	09.10bc

Means with the same letter (s) within a column are not significantly different at P = 0.05 Duncan's Multiple Range Test (DMRT).

Table 03: Weed Dry matter in (gm/m²) of Weed Species in Cowpea as Influenced by Pre emergence Herbicides at Samaru, Zaria in 2010 and 2011 at 6 WA3

Treatments	Cynodon dactylon		Echinochloa colona		Cyperus rotundus		Ageratum conyzoides		Eleusine indica	
	2010	2011	2010	2011	2010	2011	2010	2011	2010	2011
Control	29.16a	31.08a	32.35a	31.42a	14.31a	18.54a	15.82a	14.80a	14.08a	14.24a
S-Metolchlor	12.15b	11.88b	13.54b	12.64b	10.21b	09.58b	09.22b	09.34c	11.12b	12.18a
Butalachlor	11.22b	10.64b	12.40b	10.83b	08.61b	07.18c	08.38b	08.42b	08.48c	10.16b
Pendimenthaline	10.42b	10.44b	11.50b	12.04b	08.24b	08.85b	07.67b	08.78c	09.12b	09.14bc

Means with the same letter (s) within a column are not significantly different at P = 0.05 Duncan's' Multiple Range Test (DMRT).

Weed biomass (gm/m²)

Table 03 shows a significant difference on weed biomass among treatment means at P = 0.05. The control treatment significantly gave higher weed biomass than the rest treatments, while pendimenthaline significantly gave lower mean values on weed biomass at P = 0.05 in all the two cropping seasons. This observation may mean that there was less competition between the crop and weeds since chemical weed control and hand weeding were both employed under this treatment, it succeeded in eliminating most of the weeds there by resulting into a lower competition between the crop and weeds for nutrients, space, light, water and carbon dioxide. However, in the control treatment which had an opportunity for the crop and weeds to compete for nutrients, space, light, water and carbon dioxide gave the weeds the advantage to supersede the crop and utilized resources at its detriment giving the weeds the dominant advantage over cowpea. This resulted in a higher population of weeds in all plots under this treatment over other treatments and hence, higher biomass production in this treatment than the rest. This observation is in agreement with the report of Dadari (2003) that competition between weeds and crop starts right from germination of the crop up to harvest affecting both growth and yield parameters adversely.

CONCLUSION

The use of pre emergence herbicides significantly gave higher mean values of number of pods/plant, number of seeds/pod and grain yield ha-1 at P = 0.05. as compared to the control. Competition between weeds and crop starts right from germination of the crop up to harvest affecting both growth and yield parameters adversely. It is therefore recommended that farmers should employed the use of pre-emergence for cowpea production.

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