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Effect of Weed Management Practices on Yield and Economics of Clusterbean (*Cyamopsis tetragonoloba*)

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ABSTRACT

A field experiment was carried out during r*abi* 2013-14 and 2014-15 at the Regional Agricultural Research Station, Lam Guntur, Andhra Pradesh with an objective to find out the suitable weed management practice for clusterbean. The study reveals that the highest weed control efficiency (95.0%) , tallest plants (69.1 cm), highest number of clusters per plant(5.1), pods/cluster(6.0), pods/plant (26.7), seeds per pod (6.53), test weight (30.37) were observed with the treatment pendimethalin @ 1.0kg a.i /ha as PE fb imazethapyr@50g a.i./ha as POE and resulted in higher seed yield (1523kg/ha), net returns (Rs 53,450) and BCR (3.35). The pooled mean yield data indicates that the seed yield observed with Pendimethalin @ 1.0 kg a.i. / ha as PE fb Imazethapyr 50g a.i. /ha as POE at 20 DAS (1291kg/ha) was comparable with the **h**and weeding at 20 and 40DAS (1344 kg/ha) and markedly higher than all other treatments studied. However, the low cost of the chemical weed management with Pendimethalin @ 1.0 kg a.i./ ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS that resulted in highest net returns (39,850/-) and benefit cost ratio (2.61).

Key words*: Clusterbean, Economics, Imazethapyr, Weed management.*

Guar (*Cyamopsis tetragonoloba*) is an annual legume and source of guar gum also known as Gavar, Guwar or Guvar bean. It is cultivated in the rainfed areas of Rajasthan. Eighty percent of Indian guar is grown in Rajasthan drought hit areas and 80 % of world guar is grown in India. Guar crop make the soil fertile as it is legume and fix nitrogen in the soil and increases the organic matter content. It is a source of green vegetable for human. Pod is cooked as regular vegetable in western Rajasthan kitchen during the guar growing season. The crop residues after harvest of the crop are collected and stored as fodder for the animals. The camel eat it in priority.

Gum guar is a cash crop in comparison to other crops and no storage pest attack on guar. It is highly industrialized product. It is largely used in the form of guar gum powder as an additive in food, pharmaceutical, paper, textile, explosive, oil well drilling and cosmetic industries (Mudgil et.al., 2014).

It is a low water requirement crop and less susceptible to pest, shorter in duration and can be grown on any land but susceptible to excess moisture.

Guar kernel consists of protein rich germ and relatively large endosperm, containing galactomannan, which is a polysaccharide containing polymer of mannose and galactose in 2:1 ratio with many branches. It exhibits great hydrogen bonding activity with water. Thus it is chiefly used as a thicker & stabilizer.

Seeds containing gelling agent (Guar gum) is today the most use. Demand is rising rapidly due to industrial use of guar gum in industrial fracturing (oil shale gas).

Considering the above facts, the study was under taken at Regional Agricultural Research Station, Lam with an objective to find out suitable weed management practice in clusterbean.

MATERIAL AND METHODS

A field experiment was carried out during r*abi* 2013-14 and 2014-15 in black soils of Regional Agricultural Research Station, Lam, Guntur district of Andhra Pradesh with an objective to find out the suitable weed management strategy for controlling weeds in cluster bean. The experiment consisted of 9 treatments involving various weed management practices in a randomized block design with three replications. The treatments studied were, T_1- Weedy check, T_2- Hand weeding at 20 and 40 DAS, T_3- Intercultivation at 20 and 40DAS, T_4- Pendimethalin @ 1.0 kg/ ha as PE, T_5-

Table 1. Weed control efficiency and phyto toxicity score of different weed management practices in clusterbean.

Treatment	Weed control efficiency (%)				Phyto toxicity score (0-10)	
	30 DAS		60 DAS		2 WAT	4 WAT
	1st year	2nd yr	1st year	2nd yr		
T1- Weedy check	—-	——-	—	——	0	0
T2- Hand weeding at 20 and 40DAS	78.1	57.4	31.4	71.2	0	0
T3- Intercultivation at 20 and 40DAS	76.4	55.0	38.3	18.4	0	0
T4- Pendimethalin @ 1.0 kg/ ha as PE	75.4	23.8	44.8	34.3	0	0
T5- Propaquizafop ethyl 63g /ha as POE at 20 DAS	29.4	40.2	1.0	23.2	0	0
T6- Imazethapyr 100 g/ha as POE 20 DAS	74.5	64.0	39.6	82.8	1	0
T7- Pendimethalin @ 1.0 kg / ha as PE fb I.C. at 40DAS	80.4	42.7	48.0	22.3	0	0
T8- Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr as POE 50g /ha as post at 20 DAS	95.0	86.1	32.6	39.8	1	0
T9- Pendimethalin @ 1.0 kg / ha as PE fb Propaquizafop ethyl 10 EC @ 63g /ha as POE at 20 DAS	62.7	47.5	14.5	2.8	0	0

Propaquizafop ethyl 63g /ha at 20 DAS, T_6- Imazethapyr 50 g/ha as POE 20 DAS, T_7- Pendimethalin @ 1.0 kg / ha as PE fb I.C. at 40 DAS, T_8- Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS, T_9- Pendimethalin @ 1.0 kg / ha as PE fb Propaquizafop ethyl 10 EC @ 63g /ha as POE at 20 DAS.

Sowing was done with bullock drawn seed drill, Pre emergence herbicide pendimethalin was applied on the same day following the sowing at appropriate soil moisture levels with the help of knapsack sprayer fitted with flat fan nozzle by using the spray fluid @ 500 l/ha. Post emergence herbicides, Imazethapyr and propaquizafop were applied with the knapsack sprayer fitted with solid cone nozzle by using the spray fluid @ 500 l/ha. Weed dry weight samples were collected and are oven dried after initial sun drying. Data on weed dry weight, yield attributes and yield were recorded. Weed control efficiency, net returns and benefit cost ratios were calculated.

Weed control efficiency (WCE) and benefit cost ratio (BCR) were calculated by using the following formulae.

WCE = DWC - DWT/DWC X 100

Where,

DWC- Dry weight of weeds in control plot,

DWT- Dry weight of weeds in treated plot.

BCR = Gross returns / Cost of cultivation

The predominant weed flora found in the clusterbean were grasses like *Dinebra Arabica, Echinochola colonum, Panicum javanicum,* Sedge, *Cyperus rotundus* and broad leaved weeds like *Phyllanthus madaraspatanense, Commelina bengalensis, Corchrus olitorius, Trianthema portulacastrum, Parthenium hysterophorus, Digera aravense, Celotia argentia, Portulaca oleracea, Cardiospermum halicacabum, Physalis minima etc.*

RESULTS AND DISCUSSION

The results of the study were analysed and summarized as below.

Weed control efficiency:

The data pertaining to the weed control efficiency presented in the table1 indicates that it was varied due to treatments. Weed control

Table 2. Yield attributes and yield of cluster bean as influenced by weed management practices.

Treatment	Plant height (cm)		Clusters/plant		Pods/plant		Seeds/pod		Test weight (g)		Seed yield (kg/ha)	
	1st year	2nd yr	1st year	2nd yr	1st year	2nd yr	1st year	2nd yr	1st year	2nd yr	1st year	2nd yr
T1- Weedy check	34.0	33.5	2.8	2.8	4.9	16.2	4.67	5.4	30.05	34.5	204	417
T2- Hand weeding at 20 and 40DAS	69.3	42.1	4.5	4.5	23.4	27.5	6.40	5.9	29.42	35.1	1453	1235
T3- Intercultivation at 20 and 40DAS	50.3	36.1	3.5	3.5	19.2	16.8	5.86	5.5	29.53	31.6	954	448
T4- Pendimethalin @ 1.0 kg/ ha as PE	53.0	37.3	3.9	3.9	15.2	17.3	6.20	5.8	29.77	35.1	830	799
T5- Propaquizafop ethyl 63g /ha as POE at 20 DAS	52.0	35.3	3.6	3.6	13.5	13.0	5.67	5.8	29.43	33.2	568	458
T6- Imazethapyr 100 g/ha as POE 20 DAS	60.6	38.8	4.0	4.0	11.3	28.3	6.27	5.1	30.00	33.0	652	1127
T7- Pendimethalin @ 1.0 kg / ha as PE fb I.C. at 40DAS	57.5	37.8	5.0	5.0	18.7	19.7	6.46	5.7	29.98	32.7	1013	725
T8- Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr as POE 50g /ha as post at 20 DAS	69.1	35.1	5.1	5.1	26.7	27.5	6.53	5.4	30.37	34.7	1523	1059
T9- Pendimethalin @ 1.0 kg / ha as PE fb Propaquizafop ethyl 10 EC @ 63g /ha as POE at 20 DAS	47.9	32.9	2.9	2.9	18.5	12.5	5.67	5.8	29.81	32.4	939	694
SEm±	3.6	2.6	0.17	0.17	1.0	3.0	0.13	0.2	0.39	1.1	46	79.0
CD (p=0.05)	10.9	NS	0.50	0.5	3.1	8.9	0.38	NS	NS	NS	137	237
CV (%)	11.5	12.4	7.5	7.5	10.6	25.9	3.70	5.8	2.3	5.6	8.7	17.7

Table 3. Mean Seed yield and Economics of cluster bean as influenced by weed management practices.

Treatment	Mean Seed yield (kg/ha)	Net returns (Rs /ha)	BCR
T1- Weedy check	311	-4650	0.77
T2- Hand weeding at 20 and 40DAS	1344	32000	1.91
T3- Intercultivation at 20 and 40DAS	701	12850	1.58
T4- Pendimethalin @ 1.0 kg/ ha as PE	815	18050	1.80
T5- Propaquizafop ethyl 63g /ha as POE at 20 DAS	513	3450	1.16
T6- Imazethapyr 100 g/ha as POE 20 DAS	890	22300	2.00
T7- Pendimethalin @ 1.0 kg / ha as PE fb I.C. at 40DAS	869	19750	1.83
T8- Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr as POE 50g /ha as post at 20 DAS	1291	39850	2.61
T9- Pendimethalin @ 1.0 kg / ha as PE fb Propaquizafop ethyl 10 EC @ 63g /ha as POE at 20 DAS	817	16150	1.65
SEm±	810	——	——
CD (p=0.05)	130	——	——
CV (%)	9.0	——	——

efficiency was improved due to adoption of weed management practices studied. Among the management practices, hand weeding at 20 and 40DAS, inter cultivation at 20 and 40DAS, pendimethalin @ 1.0 kg/ ha as PE, propaquizafop ethyl 63g /ha as POE at 20 DAS, imazethapyr 50 g/ha as POE 20 DAS, pendimethalin @ 1.0 kg / ha as PE fb I.C. at 40 DAS, and pendimethalin @ 1.0 kg / ha as PE fb propaquizafop ethyl 10 EC @ 63g /ha as POE at20 DAS were observed with closer values of weed control efficiency. However, the treatment that received Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS indicated better values than all other treatments studied.

Phyto toxicity:

The phyto-toxicity score observed indicated that the treatment received Imazethapyr @ 50 g a.i. at 20 days after sowing as POE showed visual signs of phyto-toxicity to clusterbean by indicating with stunted growth during the second week after the treatment. However, cluster bean plants recovered well by 4 weeks after the treatment with imazethapyr (Table-1).

Yield attributes and yield:

Plant height at maturity was markedly varied due to treatments during the first year of the study. The treatment which received Imazethapyr 50 g/ha 20 DAS and Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS as well as Hand weeding at 20 and 40DAS were resulted in taller plants due to higher weed control efficiency and reduced weed competition(Table-2). Similar results of reduced weed growth and increased weed control efficiency due to application of Imazethapyr in combination with the grassy herbicides quizalofop ethyl in soybean was reported by Smith et. al. (2015).

All weed management practices results in improved number of clusters per plant, pods/plant, seeds/pod over the untreated plots due to reduced weed competition there by improved crop growth and yield attributes of cluster bean. More number of clusters, pods and seeds /pod were observed with Hand weeding at 20 and 40DAS, Imazethapyr 50 g/ha as POE 20 DAS and Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS. However, the test weight (g) of clusterbean was not influenced by the weed management practices studied.

Seed yield (Table-2) was markedly improved by all weed management practices over the weed y check during both the years of the study. The treatment received Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS gave comparable grain yield of clusterbean

with that of the Hand weeding at 20 and 40DAS during both the years of the study.

Economics:

The pooled seed yield indicates that Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS (1296 kg/ha) and Hand weeding at 20 and 40 DAS (1344 kg/ha) were observed with higher seed yield than all other treatments studied. Similarly the net returns and benifit cost ratios were followed the same trend than that of the seed yield among the herbicide treatments. However, the expensive hand weeding twice at 20 and 40 DAS results in reduced net retuns (Rs 32,000/-) and benifit cost ratio (1.91) over the Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS (Rs 39,850/- and 2.61, respectively), though it recorded higher grain yield of 1344 kg/ha (Table-3).

Conclusion:

The study clearly indicates that the treatment received Pendimethalin @ 1.0 kg / ha as PE fb Imazethapyr 50g /ha as POE at 20 DAS markedly reduced the weed growth and improved the crop growth and seed yield of clusterbean and resulted in higher net returns and benefit cost ratio due to low cost of chemical weed management.

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