

Original Research Article

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Nodulation, Leghaemoglobin Content and Yield of Greengram as Influenced by New Generation Early Post Emergence Herbicide Combinations

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ABSTRACT

Keywords

Early Post-emergence, Greengram, Root nodules, Leghaemoglobin content.

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A field experiment was conducted during *kharif* 2015 at college farm, College of Agriculture, Rajendranagar, Hyderabad to study the impact of new generation herbicide combinations on nodulation and leghemoglobin content of greengram (*Vigna radiata* L.) in South Telangana. The experiment was laid out in Randomized Block Design consisted of 11 treatments and 3 replications viz. pendimethalin @ 1.0 kg/ha as pre-emergence, pendimethalin followed by imazethapyr @ 75 g/ha as post-emergence (at 2-4 leaf stage), imazethapyr @ 75 g/ha, chlorimuron ethyl @ 9 g/ha, quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha, imazethapyr + imazamox @ 70 g/ha, propaquizafop @ 50 g/ha + imazethapyr @ 75 g/ha, haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha, cycloxydim @ 80 g/ha + imazethapyr @ 75 g/ha, hand weeding at 20 and 40 DAS and unweeded control. The herbicide combinations were applied at 12-15 DAS. The results revealed that combinations of haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha, and quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha applied 12-15 DAS were found promising for getting higher productivity without affecting the nodulation.

Introduction

Greengram is the third important pulse crop of India in terms of area 3.77 million ha and production 1.52 million tonnes (DAC, 2015). It serves as a vital source of vegetable protein (19.1–28.3 %) and vitamins (Singh *et al.*, 2015). Weed infestation is one of the major constraints in greengram cultivation and causes 50 to 90 % yield loss (Kumar *et al.*, 2006). Being a short statured crop it is invaded by a large number of fast growing weeds at initial stage. Hand weeding is effective in controlling the weeds but unavailability of labor and continuous rainfall in rainy season does not permit it to operate timely. It is also time consuming and costly. Therefore, chemical control of weed forms an

excellent alternative to manual as well as mechanical weeding and provides weed-free environment from emergence up to 30–35 days (Dungarwal *et al.*, 2003). However, the adverse impact of herbicides on nodulation in legumes was reported (Ahemad, 2012).

Impact of herbicides was evident in the form of reduced number of total and active nodules. The information regarding impact of herbicides on nodulation is scanty in greengram. Hence, the study was under taken to find out the most effective early post-emergence herbicide combinations for getting higher yield without affecting the nodulation in greengram.

Materials and Methods

Study area

The present experiment was carried out during *Kharif*, 2015 at the college farm, College of Agriculture, Rajendranagar, Hyderabad. The farm is geographically situated at an altitude of 542.6 m above mean sea level (MSL) and 78° 28' E longitude and 17° 19' N latitude and falls under the Southern Zone of Telangana State. The soil of the experimental site was classified as sandy loam in texture, neutral in reaction, low in organic carbon and available nitrogen, high in available phosphorus and potassium.

Treatments and experimental design

Eleven treatments viz. pendimethalin @ 1.0 kg/ha as pre-emergence, pendimethalin followed by imazethapyr @ 75 g/ha as post-emergence (at 2-4 leaf stage), imazethapyr @ 75 g/ha, chlorimuron ethyl @ 9 g/ha, quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha, imazethapyr + imazamox @ 70 g/ha, propaquizafop @ 50 g/ha + imazethapyr @ 75 g/ha, haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha, cycloxydim @ 80 g/ha + imazethapyr @ 75 g/ha, hand weeding at 20 and 40 DAS and unweeded control. The herbicide combinations were applied at 12-15 DAS. The experiment was laid out in Randomized Block Design with replications. The crop variety 'MGG-295' was sown on 25th July, 2015 at a spacing of 30 cm x 10 cm and fertilized with 20: 40: 30 kg N, P₂O₅ and K₂O/ha. All the herbicides were applied with knap sack sprayer fitted with flat-fan nozzle.

Plant sample collection and analysis

The roots were carefully washed to remove the adhering soil particles and the numbers of nodules were counted at 30, 38 and 45 DAS. The nodules were collected and shade dried.

Later oven dried at 65^o C for 24 hours and the final dry weights were recorded. The leghaemoglobin content in fresh nodules recovered from the root system of greengram was quantified calorimetrically as haemochromogen by the method of Hartree *et al.*, (1955) at 30, 38 and 45 days after sowing.

Yield estimation

The experimental crop was finally harvested on 10 September 2015 after taking 2 pickings of pods. The crop was sun-dried for 3 days and manual threshing was done separately for each experimental plot. The yield from all the pickings and finally harvested and threshed crop was combined to arrive at yield/ha. The analysis of variance of data was carried out using OPSTAT and significance was tested by 'F-test'.

Results and Discussion

Number of nodules/plant, dry weight nodules/plant and leghaemoglobin content differed significantly among the treatments and increased with increase in age of the crop at all the growth stages. At 30 days after sowing, significantly higher nodule attributes were recorded with hand weeding at 20 and 40 DAS whereas significantly lower nodule attributes were observed with chlorimuron ethyl at 9 g/ha at 12-15 DAS due to its phytotoxicity. At 38 days after sowing significantly higher number of nodule parameters were observed with hand weeding at 20 and 40 days after sowing which was on a par with haloxyfop-p-methyl + imazethapyr, and quizalofop ethyl + imazethapyr. The trend was similar at 45 DAS too. Higher nodule attributes in hand weeding at 20 and 40 days after sowing at all the growth stages was due to increased aeration of *Rhizosphere* in disturbed soil condition. The results were in conformity with Raman and Krishnamoorthy (2005) (Table 1).

Table.1 Effect of early post-emergence herbicides on yield, nodulation and leg haemoglobin content of greengram

Treatment	Nodule (Nos./plant)			Dry weight (mg/plant)			Leg haemoglobin content (mg/g)			Seed yield (kg/ha)
	30 DAS	38 DAS	45 DAS	30 DAS	38 DAS	45 DAS	30 DAS	38 DAS	45 DAS	
Pendimethalin @ 1 kg/ha as pre-emergence	24.0	27.2	29.8	18.0	27.0	30.2	0.37	0.77	1.00	426
Pendimethalin @ 1 kg/ha followed by imazethapyr @ 75 g/ha as post-emergence (at 2-4 leaf stage)	21.0	28.2	34.1	18.1	29.0	35.0	0.39	0.81	1.03	912
Imazethapyr @ 75 g/ha	20.3	27.2	33.4	18.0	27.7	32.6	0.38	0.78	1.01	742
Chlorimuron ethyl @ 9 g/ha	9.5	14.5	15.2	12.3	12.6	15.8	0.18	0.45	0.73	224
Quizalofop ethyl @ 50 g/ha + imazethapyr @ 75 g/ha	23.8	32.8	39.0	19.5	33.0	44.0	0.40	0.82	1.03	1008
Imazethapyr @ + imazamox @ 70 g/ha	20.8	27.8	33.6	18.0	28.8	34.8	0.39	0.79	1.02	900
Propaquizafop @ 50 g/ha + imazethapyr @ 75 g/ha	21.0	28.2	34.2	18.5	29.3	35.4	0.40	0.81	1.03	920
Haloxyfop-p-methyl @ 135 g/ha + imazethapyr @ 75 g/ha	24.2	32.9	41.2	19.5	33.8	44.7	0.40	0.83	1.04	1029
Cycloxydim @ 80 g/ha + imazethapyr @ 75 g/ha	20.0	28.2	33.2	18.0	27.0	32.0	0.37	0.79	1.01	737
Hand weeding at 20 and 40 DAS	32.3	36.4	42.8	22.6	36.5	48.6	0.48	0.95	1.19	1086
Unweeded control	15.0	23.2	26.5	15.2	25.0	30.6	0.01	0.55	0.84	425
S Em ±	0.97	1.37	1.42	0.56	1.28	1.68	0.02	0.04	0.05	28
CD (P=0.05)	2.80	3.70	4.11	1.68	3.65	4.87	0.06	0.12	0.15	82

The seed yield was significantly superior with hand weeding at 20 and 40 DAS, and was on a par with haloxyfop-p-methyl at 135 g/ha + imazethapyr at 75 g/ha applied at 12-15 DAS and quizalofop ethyl at 50 g/ha + imazethapyr at 75 g/ha applied at 12-15 DAS. The combination of early post-emergence herbicides resulted in superior control of weeds leading to higher seed yield. These results corroborate the findings of Kaur *et al.*, (2009) and Raj *et al.*, (2012).

It is concluded that from the above findings it is clearly indicated that the combinations of haloxyfop-p-methyl at 135 g/ha + imazethapyr at 75 g/ha, and quizalofop ethyl at 50 g/ha + imazethapyr at 75 g/ha applied at 12-15 days after sowing as an early post-emergence can be recommended for weed control in greengram in Southern Zone of Telangana for getting higher yield without affecting the nodulation.

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