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IMPACT OF HERBICIDE APPLICATION ON WEED CHARACTERISTICS AND YIELD POTENTIAL IN GREEN GRAM

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ABSTRACT

The efficiency of three herbicides *viz.*, fluchloralin (0.90 kg ha^{-1}), thiobencarb (1.25 kg ha^{-1}) and metolachlor (1.00 kg ha^{-1}) on weed characteristics such as weed flora, relative density and relative dry weight of weeds, weed control efficiency, weed index and gran yield of three green gram cultivars *viz.*, Co 4, NARP 1 and Co GG 89047 were evaluated in the field conditions. Among them, metolachlor followed by fluchloralin and thiobencarb reduced the relative density and relative dry weight of weeds over unweeded control. The sedge (*Cyperus rotundus*) was dominant followed by broad leaved weeds *viz.*, (*Trianthema portulacastrum and Amaranthus viridis*). The broad leaved weeds contributed more dry weight because of their expanded leaf area and faster growth rate. The pre-emergence application of metolachlor followed by pre-sowing incorporation recorded maximum weed control efficiency and was on par with hand weeding. Higher weed index was observed in unweeded control irrespective of cultivars and the least was in metolachlor and this lead to higher grain yield in metolachlor treatment. Among the cultivars used, Co GG 89047 was found to be best and recorded higher grain yield.

KEY WORDS : Herbicides, impact, weeds, green gram, yield

The yield of mungbean is reduced by about 45 to 50 per cent by weeds and under very severe conditions the reduction is even extended upto 70 to 85 per cent (Yadav *et al* 1982). In mungbean, weeds lead to maximum competition between 25 and 40 days of sowing, hence the effective usage of herbicides at this critical stage plays a significant role in maintaining the productivity by offsetting the weed interference. However, the weeds which occur after this critical period are smothered by the crop canopy. Hence, in order to minimise the weed competition and augment the crop productivity, the usage of herbicides become inevitable.

MATERIALS AND METHODS

The investigations were carried out in the fields of Tamil Nadu Agricultural University, Coimbatore, during *kharif* season, 1991. The soil of the experimental field was vertisol. Three cultivars *viz.*, Co 4, NARP 1 and Co GG 89047 were used. Th following treatments were adopted : unweeded control (C), hand weeding (HW), pre-sowing ncorporation (PI) and pre-emergence (PE) application of fluchloralin (F) 0.90 kg ha^{-1}, thioben carb (T) 1.25 kg ha^{-1} and metolachlor (M) 1.00 kg ha^{-1} respectively. In the case of pre-emergence, the herbicides were sprayed 3 days after sowing. The hand weeding was given 20 days after sowing. The treatments were replicated thrice and the experiment was carried out in a factorial randomised block design. A fertilizer schedule of 25 kg N and 50 kg P_2O_5 ha^{-1} was followed as basal dressing. The seeds of cultivars were pretreated with fungicide bavistin at 2 g kg^{-1} of seed and 12 hours before sowing, it was inoculated with Rhizobium. Adequate plant protection measures were adopted and the crop was periodically irrigated.

The weed flora occured during the crop growth period was recorded. The relative density (RD) and relative dry weight (RDW) of weeds, weed control efficiency (WCE) and weed index (WI) were calculated by normal methods.

RESULTS AND DISCUSSION

Weed flora

The weed flora of the experimental field comprised eight species Among them, three species *viz.*, *Cynodon dactylon, Dactyloctenium aegyptium* and *Digitaria sanquinalis* belong to grasses ; one species, *Cyperus rotundus* under sedges and the remaining *viz.*, *Trianthema portulcastrum, Amaranthus viridis, Flaveria australasica* and *Parthenium hysterophorus* were broad leaved

Table 1. Herbicide efficacy on relative density of weeds (%) at different growth stages of green gram cultivars

Treatment	20 Days after sowing			30 Days after sowing			45 Days after sowing		
	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves
C	26.1	24.4	49.5	23.9	29.7	46.4	23.1	28.7	48.2
HW	21.2	25.8	53.0	38.8	37.0	24.2	28.0	27.7	44.3
^{PI} F 0.90	9.6	82.1	8.3	8.3	75.1	16.6	13.7	53.8	32.5
^{PI} F 0.90	4.5	50.1	11.1	11.1	42.3	46.6	15.0	41.1	43.9
^{PI} T 1.25	3.4	43.5	13.9	13.9	35.1	51.0	14.9	36.8	48.3
^{PE} T 1.25	6.5	49.1	10.3	10.3	41.2	48.5	15.9	38.2	45.9
^{PI} M 1.00	14.3	39.4	13.8	13.8	29.8	56.4	15.4	33.1	51.5
^{PE} M 1.00	8.9	63.5	10.0	10.0	52.1	37.9	11.6	44.0	44.4

Treatment	60 Days after sowing			75 Days after sowing			90 Days after sowing		
	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves
C	25.0	30.0	45.0	25.6	29.8	44.6	26.1	30.2	43.7
HW	18.8	46.5	34.7	18.9	41.0	40.1	21.6	38.8	39.6
^{PI} F 0.90	19.0	48.6	32.4	19.6	43.1	37.6	20.3	42.7	37.0
^{PI} F 0.90	22.0	49.2	28.8	19.1	39.8	41.1	19.9	39.3	40.8
^{PI} T 1.25	23.3	44.6	32.1	21.6	39.6	38.8	22.3	40.3	37.4
^{PE} T 1.25	19.9	45.6	34.5	19.5	40.0	40.5	20.9	39.7	39.4
^{PI} M 1.00	24.4	39.5	36.1	21.1	40.2	38.7	22.1	41 7	36.2
^{PE} M 1.00	24.1	45.5	30.4	22.5	40.9	36.6	22.6	41.3	36.1

C : Control ; HW : Hand weeding; PI : Pre-sowing incorporation ; PE : Pre-emergence application, F : Fluchloralin : M : Metolachlor ; T : Thiobencarb

weeds. *Trianthema portulacastrum* was abundant followed by sedges and grasses at all stages. At early stages. the sedges were dominant than broad leaved weeds, as herbicides could control the broad leaved weeds considerably.

Relative density (RD)

The per cent density of sedges was more at seedling stage and it was reduced slightly, due to the late growth of grasses and broad leaved weeds consequent to the degradation of herbicide in the soil irrespective of varieties. The poor emergence of grass and broad leaved weeds even after manual weeding given on 45th day, lead to domination of sedge at pod formation stage (60 days after sowing (DAS)) beyond which its density reduced slightly due to the occurrence of broad leaved weeds at later stages (Table 1). *T. portulacastrum*, followed by *A. viridis* were more high among broad leaved weeds.

The metolachlor controlled broad leaved and grass weeds to the maximum and the next best was fluchloralin. However, its effect was lower than HW. The grasses and sedge consititute 30 to 40 per cent and the remaining by the broad leaved weeds The dominance of sedge and broad leaved weeds and their consequent effect on yield reduction observed in the experiment has strongly been supported by Daulay and Singh (1982).

Relative dry weight (RDW)

RDW contributed by sedges was maximum at early stage (38.5 to 92.8& 20 DAS) compared to 3.0 to 48.8% of broad leaved weeds, which could be controlled by herbicides (Table 2). The grasses accounted only minimum (0.5 to 14.4%). But with advance in age of crop, the biomass of broad leaved and grass weeds was increased considerably (38.2 to 69.0) by depleting the share by sedges. There was no variation regarding the effect of cultivars on RDW. Due to faster growth of broad leaved weeds at later stages of crop growth, the RDW of broad leaved weeds was comparatively higher. Hence, in green gram the weed growth in terms of its dry matter production upto a critical period of 40 to 45 DAS drastically reduced the accumulation of crop dry matter and grain yield.

Table 2. Herbicide efficacy on relative dry weight of weeds (%) at different growth stages of green gram cultivars

Treatment	20 Days after sowing			30 Days after sowing			45 Days after sowing		
	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves
C	9.8	43.9	46.3	15.7	21.2	63.1	14.5	19.8	65.7
HW	9.2	46.8	44.0	39.2	32.4	28.4	23.7	23.3	53.0
^{PI}F 0.90	2.9	92.3	4.8	9.9	64.2	25.9	12.4	43.7	43.9
^{PI}F 0.90	2.4	71.6	26.0	12.0	37.1	50.9	14.2	35.4	50.4
^{PI}T 1.25	3.3	67.5	29.2	14.0	32.6	53.4	14.3	32.4	53.3
^{PE}T 1.25	4.1	70.9	25.0	9.3	39.7	51.0	11.1	35.8	53.1
^{PI}M 1.00	5.9	61.6	32.5	9.4	28.2	62.4	13.2	30.6	56.2
^{PE}M 1.00	2.7	81.6	15.7	7.7	50.7	41.6	10.7	37.7	51.6

Treatment	60 Days after sowing			75 Days after sowing			90 Days after sowing		
	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves	Grasses	Sedges	Broad leaves
C	15.2	23.3	61.5	15.1	23.2	61.7	15.6	23.4	61.0
HW	21.3	32.3	46.4	22.6	32.7	44.7	22.5	28.0	49.5
^{PI}F 0.90	18.0	36.0	46.0	21.3	35.5	43.2	20.1	31.1	48.8
^{PI}F 0.90	23.9	36.4	39.7	21.8	34.9	43.3	19.3	30.5	50.2
^{PI}T 1.25	24.2	34.2	41.6	23.1	36.5	40.4	20.3	30.4	49.3
^{PE}T 1.25	18.6	35.0	46.4	21.9	34.9	43.2	19.9	30.1	50.0
^{PI}M 1.00	21.9	30.1	48.0	21.7	35.4	42.9	19.2	31.8	49.0
^{PE}M 1.00	24.1	34.0	41.9	22.9	32.9	44.2	25.8	35.0	39.2

Weed control efficiency (WCE)

All the herbicides tested considerably increased the WCE, and the values were high at early stages of crop growth, due to the suppression of grasses and broad leaved weeds irrespective of cultivats. The herbicide efficiency depleted gradually attaining a maximum at flowering stage (53.5%) (Table 3). But due to hand weed at 45 DAS and reduced regrowth rate of weeds, compared to control, the efficiency was improved better at later stages. Among the herbicides, metolachlor followed by PI of fluchloralin reduced regrowth rate of weeds, compared to control. the efficiency, was improved better at later stages, and this is in line with the findings of Srinivasan *et al.*. (1990) in mungbean, where PE applied fluchloralin controlled broad leaved weeds at initial crop growth.

Table 3. Effect of herbicides on weed control efficiency (WCE), weed index (WI) and grain yield of green gram cultivars

Treatment	WCE			WI (%)			Grain yield (kg ha^{-1})			Mean
	C_1	C_2	C_3	C_1	C_2	C_3	C_1	C_2	C_3	
C	-	-	-	44.1	45.3	43.1	820	1410	1370	1200
HW	78.9	76.8	77.9	3.9	3.0	-1.1	1326	1315	1341	1327
^{PI}F 0.90	71.8	70.7	70.6	6.6	6.2	2.8	1425	1468	840	1244
^{PI}F 0.90	70.0	70.5	66.0	9.7	5.4	3.3	1491	1441	1453	1462
^{PI}T 1.25	67.1	67.1	66.2	10.4	8.4	3.6	1408	1425	1508	1447
^{PE}T 1.25	66.0	69.9	67.6	8.6	7.3	3.8	1538	880	1564	1327
^{PI}M 1.00	75.1	75.4	72.1	2.9	1.8	2.2	1504	1497	1492	1498
^{PE}M 1.00	76.8	76.4	71.9	-	-	-	1488	1514	1539	1517
Mean	72.2	72.4	60.3	-	-	-	1375	1369	1300	-

Grain Yield

C.D : Significant 5% level

Treatment	15.19
Cultivar	9.30
Treatment x Cultivar	26.31

Weed index (WI)

The WI indicates the level of competition between crop and uncontrolled weed for inputs. The lowest WI of 2.9, 1.8 and 2.2 per cent was recorded in PI of metolachlor in Co 4, NARP 1 and Co GG 89047 respectively followed by HW which recorded 3.9, 3.9 and -1.1 per cent in the above cultivars. The highest WI of 44.1, 45.3 and 43.1 per cent was recorded in C in the above cultivars (Table 3). Among the cultivars, Co GG 89047 was superior than NARP 1 and Co 4.

Grain yield (GY)

Herbicide application significantly increased the GY over the unweeded control and the metolachlor followed by fluchloralin could considerably reduce the weed population, dry weight, and thereby increased the WCE and resulted in higher grain yield (Table 3) as reported by Singh *et al.*, (1988) in green gram. Hence to maintain the yield potentiality of crop, either PI of PE application of herbicide followed by one hand weeding at flowering stage will be more economical.

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EFFECT OF TIME OF NITROGEN APPLICATION ON GROWTH, YIELD AND ECONOMICS OF IRRIGATED RICE

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ABSTRACT

Field experiments were conducted at the Agricultural Research Station, Bhavanisagar during *kharif* seasons of 1994 and 1995 on transplanted rice to study the effect of doses and timing of N application. Increasing rate of N application upto 200 kg N/ha significantly increased the grain yield mainly dur to improvement in yield attributes like productive tillers and filled grains per panicle. N applied in 5 splits at 7 DAT, active tillering, panicle initiation heading and floweing stages along with *Sesbania rostrata* incorporation produced maximum grain yield and economics.

KEY WORDS : Transplanted rice, N fertilizer, split application, *Sesbania rostrata*, grain yield.

There are two reasons for not getting expected yield levels after application of fertilizer N to rice. Either, the recovery of fertilizer N is poor or the efficiency at which N once taken up, is used for grain production is low (Dash *et al.*, 1993) Nitrogen is an important growth limiting factor for rice. De Datta and Patrick (1986) reported that recovery of fertilizer N applied at different growth stages may vary widely. It is, therefore, important to develop a good understanding of the processes of N transformations in soil and plant. The cost of N during the past decades in India has increased four fold. Rice farmers with small land holdings are, therefore, more and more burdened with the high cost of chemical fertilizer. Hence, locally available alternative N sources need to be explored for use in lowland rice. In this context, green manure may offer a good and cheap alternative to inorganic fertilizer. Field experiments were undertaken to study the use of *Sesbania rostrata* as a N source for growth and yield of irrigated lowland rice.