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EFFECT OF INTEGRATED WEED MANAGEMENT ON GROWTH INDICES AND STOVER YIELD OF SOYBEAN

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SUMMARY

A field experiment was conducted at JNKVV, Zonal Research Station, at College of Agriculture, Indore (M. P.) during the **kharif** season on a well drained deep clay soil, low in available N, medium in phosphorus and high in available potassium with normal pH (7.6). The experiment was laid out in randomised block design replicated thrice with the treatments consisting of different levels of clomazone, trifluralin, imazethpyr+pendimethalin, imazaquin along with their combination with interculture, which were compared with weedy check, farmers' practice and weed free up to 60 days. At 75 DAS, the highest dry matter per plant was recorded under weed free plots followed by trifluralin+IC, while the lowest dry matter/plant was recorded from unweeded control plot. At harvest, the highest dry matter per plant was recorded under weed free plot but it was at par from trifluralin+IC and other integrated weed management methods. The highest stover yield (4053 kg/ha) was obtained under weed free condition which was at par with treatment trifluralin+IC (IWM). The lowest stover yield (1941 kg/ha) was recorded under weedy check. The NAR was highest under farmers' practices at 30-45 DAS interval, while at 45-60 DAS it was maximum in imazaquin 120 g+IC treatments followed by imazaquin 120 g/ha and in both intervals it was the lowest in weedy check. CGR was the highest under weed free plots followed by (0.253) in trifluralin+IC treated plots at 15-30 and 30-45 DAS interval. But at 45-60 DAS, the higher CGR was recorded (0.550) under imazethapyr+IC treated plots followed by (0.542) in farmers' practice. At 60-75 DAS interval, the highest CGR was recorded (1.088) under weed free plot followed by (1.044) by clomazone 750 g+IC. RGR was highest under farmers' practices at 30-45 and 45-60 DAS and weedy control at 60-75 DAS interval.

Key words : Soybean, integrated weed management, dry matter, stover yield, growth indices

Soybean is one of the important crops of the world. Being the richest, cheapest and easiest source of best quality proteins and fats and having a vast multiplicity of uses as food and industrial products, soybean is sometimes called a wonder crop. It builds up the soil fertility by fixing large amounts of atmospheric nitrogen through the root nodules, and also through leaf fall on the ground at maturity. It can be used as fodder; forage can be made into hay, silage, etc. Its forage and cake are excellent nutritive foods for livestock and poultry. India is the 5th largest producer but its share in world soybean production is only 3%. At the present it is restricted mainly to Madhya Pradesh, Uttar Pradesh, Maharashtra and Gujarat. Weed infestation is one of the major problems causing about 37 per cent reduction in soybean yield (Arya *et al.*, 1994). Herbicides are considered almost inevitable in modern weed management as they control the weeds at a comparatively lower production cost. But, environmental factors like humidity and sunlight, etc. and some other factors like quality, quantity, time and mode of application of herbicide, crops and weed flora, chemical structure and formulation of herbicides, etc. also affect the efficiency. Keeping this in view, an investigation was undertaken to evolve suitable integrated weed management in soybean.

MATERIALS AND METHODS

A field experiment was conducted at JNKVV, Zonal Research Station, at College of Agriculture, Indore (M. P.) during the **kharif** season of 2001-02 situated at 24.43^{o}N latitude and 75.66^{o}E longitude with an altitude

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of 555.5 MSL, having sub-tropical semi-arid type climate with an average annual rainfall of 941 mm. The experimental soil was well drained deep clay, low in available N, medium in phosphorus and high in available potassium with normal pH (7.6). The experimental treatments consisted of different levels of clomazone, trifluralin, imazethpyr+pendimethalin, imazaquin along with their combination with interculture, which were compared with weedy check, farmers' practice and weed free up to 60 days. The details of experimental treatments are given in Table 1. The experiment was laid out in randomised block design with three replications. Soybean variety JS-335 was planted on 24 June 2001, keeping row to row distance 30 cm, alley between plots 50 cm and alley between replications 1 meter. All recommended cultural practices were followed, except for the weed management practices as per the treatments. The data on dry matter accumulation were subjected to analysis of variance calculated as per standard procedure suggested by Panse and Sukhatme (1985). NAR as measure of net photosynthesis or dry matter accumulation per unit leaf area per unit time was estimated between 30 and 45 DAS and 45 to 60 DAS growth interval. CGR is a measure of overall growth rate of a crop plant. It is measured after a fixed time interval irrespective of previous growth rate. RGR is a measure of the increase in dry weight per unit of original dry weight over specific time interval.

TABLE 1
Details of the experimental treatments

Treatment	Mode of application	Formulation	Dose/ha
T_1–Control (weedy check)	-	-	-
T_2–Farmer's practice	IC at 15 DAS + HW at 30 DAS	-	-
T_3–Weed free up to 60 days	2 IC at 15 and 25 DAS+2 HW at 20 and 30 DAS	-	-
T_4–Clomazone	Pre-emergence	50% EC	750 g
T_5–Clomazone	Pre-emergence	50% EC	850 g
T_6–Trifluralin	PPI	48% EC	960 g
T_7–Imazethapyr+Pendimethalin	Pre emergence	F. P.	3 litre
T_8–Imazaquin	PPI	13.5 EC	120 g
T_9–Imazethapyr	PPI	10% SL	120 g
T_{10}–Clomazone+IC	Pre-em.+25 DAS	50% EC	750 g
T_{11}–Clomazone+IC	Pre-em.+25 DAS	50% EC	850 g
T_{12}–Trifluralin+IC	PPI+25 DAS	48% EC	960 g
T_{13}–Imazethapyr+Pendimethalin+IC	Pre-em.+25 DAS	F. P.	3 litre
T_{14}–Imazequin+IC	PPI+25 DAS	13.5% SL	120 g
T_{15}–Imazethapyr+IC	PPI+25 DAS	10% SL	

RESULTS AND DISCUSSION

Dry Matter Accumulation

The dry matter per plant gradually increased with the age of the crop till 75 DAS (Table 2). The rate of dry matter accumulation was maximum between 60 to 75 DAS which was then slowed down, following a normal growth pattern. At the maximum growth stage (75 DAS), the highest dry matter per plant was recorded under weed free plots followed by trifluralin+IC. The lowest dry matter/plant was recorded from unweeded control plot, followed by clomazone 750 g/ha. At harvest, amongst integrated methods of weed management, the highest dry matter per plant was recorded under weed free plot but it was at par from trifluralin+IC and other integrated weed management methods. All single herbicides were at par with each other, however, significantly superior to control. The dry weight per plant at harvest in case of integrated method of weed management was more than any of the herbicide applied alone as pre-emergence or PPI. The differential dry matter accumulation by soybean under different treatments at various stages was due to differential level of competition stress for nutrient, moisture and light and space under different treatments posed by the presence of weeds. The weeds absorb large amount of nutrients from the soil as reported by Singh and Kolar (1994), Suresh and Reddy (1995) and Chhokar *et al.* (1995). Increase in growth characters of crop plant due to control of weeds by mechanical or cultural methods as seen in present case was

TABLE 2
Mean dry matter of soybean plant as influenced by different treatments at successive stage of crop growth

Treatment	Dry matter/plant (g)						Stover yield (kg/ha)
	15 DAS	30 DAS	45 DAS	60 DAS	75 DAS	Harvest	
T_1	0.67	3.00	5.73	10.50	24.00	21.00	1941
T_2	0.75	3.13	7.07	15.20	26.90	24.20	2554
T_3	1.13	5.10	9.33	17.35	33.68	30.62	4053
T_4	0.80	3.80	6.83	12.67	24.38	22.33	2745
T_5	0.85	4.00	7.20	13.67	25.40	24.10	2872
T_6	0.93	4.25	7.68	14.20	27.02	25.20	3206
T_7	0.93	4.23	7.82	14.85	28.40	26.37	3428
T_8	0.93	3.93	7.50	15.60	26.10	24.20	2885
T_9	1.00	4.03	7.05	14.40	25.40	23.20	3237
T_{10}	1.00	4.40	8.63	16.13	29.42	27.60	2942
T_{11}	1.10	4.47	8.57	15.52	28.90	26.75	3047
T_{12}	1.20	5.00	9.10	17.17	32.83	28.80	3571
T_{13}	1.00	4.60	8.28	16.15	29.07	27.02	3482
T_{14}	1.00	4.67	8.42	17.85	31.30	28.20	3174
T_{15}	1.20	5.00	9.00	17.25	31.10	28.80	3444
C. D. (P=0.05)	0.27	1.21	1.87	3.76	4.42	4.60	542.35

reported also by Tiwari *et al*. (1993) and Kurmavanshi *et al*. (1995).

Stover Yield

The highest stover yield (4053 kg/ha) was obtained under weed free condition which was at par with treatment trifluralin+IC (IWM). The lowest stover yield (1941 kg/ha) was recorded under weedy check (Table 2). Among sole herbicides, use of trifluralin, imazethapyr+pendimethalin (FP) and imazethapyr was found superior to farmers' practice and clomazone. Integrated method i. e. herbicide+IC gave higher stover yield than the sole herbicidal treatment. In integrated weed management method/treatment trifluralin+IC was superior over other integrated treatments followed by imazethapyr+pendimethalin (FP)+IC. It was also observed from the data that stover yield increased significantly with various weed management practices than under control (T_1) and farmers' practice. Maximum (4053 kg/ha) stover yield was recorded under weed free plots followed by trifluralin+IC (T_{12}) and T_{13}, T_{15} and T_7. The probable reason for this trend may be due to increased dry matter accumulation per plant. These findings are in confirmation with the findings of Tiwari *et al*. (1993), Balyan and Malik (1998) and Hadizadeh and Rahimian (1998).

Net Assimilation Rate (NAR)

The highest NAR 35.18 between 30 and 45 DAS interval was under farmers' practice and was the lowest (30.35) in weedy check (Table 3). The NAR at 45-60 DAS was higher than that of 30-45 DAS and the highest NAR at 45 - 60 DAS interval was recorded in imazaquin 120 g+IC (89.79) treatments followed by imazaquin 120 g/ha. It was the lowest (58.39) in weedy check followed by farmers' practice (60.24).

Crop Growth Rate (CGR)

The CGR was highest between 60 and 75 DAS and was lowest between 15 to 30 DAS period (Table 3). At 15-30 DAS interval, it was the highest (0.264) under weed free plots followed by (0.253) in trifluralin+IC treated plots and lowest (0.155) under weedy control followed by (0.158) in farmers' practice. This may be due to the fact that herbicide treated plots kept control over weed population and crop growth increased. At 30-45 DAS it followed the same pattern but at 45-60 DAS, the higher CGR was recorded (0.550) under imazethapyr+IC treated plots followed (0.542) in farmers' practice. At 60 to 75 DAS interval, the highest CGR was recorded (1.088) under weed free plot followed by (1.044) in clomazone 750 g+IC.

TABLE 3
Net assimilation rate (NAR), crop growth rate (CGR) and relative growth rate (RGR) of soybean as influenced by different weed control treatments

Treatment	NAR (mg/dm^2)			CGR (g/day)			RGR (g/g/day)		
	30-45 DAS	15-30 DAS	15-30 DAS	30-45 DAS	45-60 DAS	60-75 DAS	30-45 DAS	45-60 DAS	60-75 DAS
T_1	30.35	58.39	0.155	0.182	0.318	0.900	0.043	0.040	0.051
T_2	35.18	60.24	0.158	0.262	0.542	0.753	0.054	0.051	0.038
T_3	38.91	69.23	0.264	0.282	0.534	1.088	0.040	0.041	0.044
T_4	34.01	61.37	0.200	0.202	0.389	0.782	0.039	0.043	0.041
T_5	34.81	66.22	0.210	0.213	0.431	0.854	0.039	0.042	0.041
T_6	34.79	61.89	0.220	0.228	0.434	0.903	0.039	0.042	0.040
T_7	35.49	65.79	0.220	0.239	0.468	0.700	0.040	0.043	0.042
T_8	38.09	81.52	0.200	0.238	0.540	0.733	0.043	0.048	0.035
T_9	30.35	69.28	0.202	0.211	0.490	0.886	0.037	0.047	0.037
T_{10}	44.59	73.57	0.226	0.282	0.500	0.825	0.041	0.044	0.040
T_{11}	42.89	77.13	0.224	0.273	0.530	1.044	0.043	0.043	0.039
T_{12}	39.05	72.48	0.253	0.273	0.538	0.861	0.039	0.043	0.042
T_{13}	36.30	72.64	0.240	0.245	0.524	0.891	0.039	0.044	0.039
T_{14}	38.29	89.79	0.244	0.250	0.528	0.896	0.039	0.050	0.037
T_{15}	39.75	76.95	0.253	0.266	0.550	0.923	0.039	0.043	0.039

Relative Growth Rate (RGR)

The RGR increased up to 65 DAS under different treatments and then decreased except under weedy control (Table 3). The RGR increased from 15 DAS to until 60 DAS. At 30 to 45 DAS interval it was higher (0.054) under farmers' practice and lowest (0.037) under imazethapyr 120 g treated plots. At 45-60 DAS interval it was highest (0.051) under farmers' practice followed by (0.050) in imazaquin 120 g+IC and it was lowest (0.040) under weedy check followed by (0.041) in weed free plots. At 60-75 DAS interval, it was highest (0.051) under weedy control followed by weed free plots and it was lowest (0.035) under imazaquin 120 g treated plots followed by (0.037) in imazethapyr 120 g and imazaquin 120 g+IC treated plots.

REFERENCES

Arya, M. P. S., R. V. Singh, and Govindra Singh, 1994 : *Indian J. Agron.*, **39** : 136-139.

Balyan, R. S., and R. K. Malik, 1998 : *Indian J. Weed Sci*., **30** : 153-157.

Chhokar, R. S., R. S. Balyan, and S. S. Pahuja, 1995 : *Annals of Biology, Ludhiana*, **11** : 201-204.

Hadizadeh, M. H., and H. Rahimian, 1998 : *Iranian J. Pl. Path*., **34** : 25-29.

Kurmavanshi, S. M., T. R. Sahu, and R. S. Sharma, 1995 : *Crop Res., Hisar*, **9** : 390-393.

Panse, V. G., and P. V. Sukhatame, 1985 : *Statistical Methods for Agricultural Worker (3rd edn.)*. ICAR, New Delhi.

Singh, H., and J. S. Kolar, 1994 : *Indian J. Weed Sci*., **26** : 83-86.

Suresh, G., and N. V. Reddy, 1995 : *New Agriculturist*, **6** : 77-79.

Tiwari, P. N., D. S. Kailashia, and S. K. Chourasia, 1993 : *JNKVV Res. J*., **27** : 124-125.