

Studies on the effect of clomazone - pendimethalin readymix on the nutrient uptake and yield of soybean [*Glycine max* (L.) Merrill]

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ABSTRACT

An experiment was conducted during June-September, 2002 on clay loam soil of Tamil Nadu Agricultural University, Coimbatore to study the effect of clomazone - pendimethalin readymix on the nutrient uptake and yield of soybean. The treatments constituted clomazone - pendimethalin readymix at different doses compared with recommended doses of clomazone and pendimethalin as well as the farmers practice of hand weeding twice and unweeded control. The clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the highest plant height and crop dry matter production and thus resulted in the highest uptake of nutrients (N, P and K). The clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ registered the highest grain yield followed by hand weeding twice treatments.

Key words : Soybean, Clomazone – pendimethalin, Nutrient uptake, Yield.

INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] has been proclaimed as the miracle crop as it plays a greater role in boosting protein and oil production in India. It occupies third place among the major oil seed crops and Madhya Pradesh leads in area (2.5 m ha) and production (2.96m tonnes) among the major states (Singh and Bhan, 2002). Weed infestation in soybean is one of the main constraints which limits the crop yield. A yield reduction of 20 to 77 per cent was reported in soybean due to weed competition (Kurchania *et al.*, 2001). In the recent past, number of herbicides and herbicide combinations are being developed in order to achieve broader spectrum of weed control. Clomazone, a new pre- emergence herbicide introduced for soybean crop, control annual and broad leaved weeds effectively (Singh *et al.*, 2001). Pendimethalin, is a selective pre-emergence dinitroaniline herbicide used for the control of grasses and annual broad leaved weeds. The readymix combination of clomazone with pendimethalin has assumed to give broad spectrum of weed control in soybean. The present investigation was, therefore, undertaken with the objective to study the nutrient uptake and crop yield as affected by clomazone - pendimethalin readymix.

MATERIALS AND METHODS

A field experiment was conducted during June-September, 2002 in Eastern Block of Tamil Nadu Agricultural University, Coimbatore to study the effect of clomazone - pendimethalin readymix on the nutrient uptake and yield of soybean. The soil was clay loam analyzing low in KMnO₄-N (196.0 kg ha⁻¹), medium in Olsen's -P (20.0 kg ha⁻¹) and medium in NH₄OAC-K (237.0 kg ha⁻¹). The experiment was laid out in Randomized Block Design with the treatments replicated thrice. The treatments consisted of pre-emergence application of clomazone - pendimethalin readymix at various doses compared with farmers practice of hand weeding twice and unweeded control. The treatments were as follows,

- T₁ - Clomazone - pendimethalin readymix @ 1.5 lit ha⁻¹
- T₂ - Clomazone - pendimethalin readymix @ 2.0 lit ha⁻¹
- T₃ - Clomazone - pendimethalin readymix @ 3.0 lit ha⁻¹
- T₄ - Clomazone - pendimethalin readymix @ 4.0 lit ha⁻¹
- T₅ - Clomazone - pendimethalin readymix @ 6.0 lit ha⁻¹
- T₆ - Clomazone - pendimethalin readymix @ 8.0 lit ha⁻¹
- T₇ - Clomazone 50 EC- 500g ha⁻¹
- T₈ - Pendimethalin 30 EC- 1000g ha⁻¹
- T₉ - Hand weeding twice
- T₁₀ - Unweeded control

Soybean variety CO-2 was sown at the seed rate of 60-70 kg ha⁻¹. Sowing was done on 6.06.02 and harvesting was done on 3.09.02. Plant samples collected at 20,40 and 60 DAS for dry matter estimation were used for plant analyses. The samples were dried and powdered and were analysed for N, P and K contents. Nitrogen content in the plant samples was estimated using microkjeldahl method suggested by Humphries (1956) and expressed as percentage on oven dry basis. The uptake of nitrogen was computed by multiplying the N content with dry matter and expressed in kg ha⁻¹. Phosphorus content was estimated using vanado-molybdo phosphoric yellow colour method suggested by Jackson (1973) with the help of a spectrophotometer. Potassium content was estimated using triple acid method (Jackson, 1973) with flame photometer and expressed on oven dry basis.

RESULTS AND DISCUSSION

Nitrogen uptake

The N uptake by soybean showed significant differences between various treatments. At 20 DAS, the nitrogen uptake was highest in clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ (4.13 kg ha⁻¹) and the unweeded control recorded the lowest uptake (2.38 kg ha⁻¹). At 40 DAS clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ registered the highest N uptake (23.9 kg ha⁻¹) which was followed by hand weeding twice treatment and clomazone - pendimethalin readymix at 3.0 lit ha⁻¹. At 60 DAS, the highest N uptake was recorded in clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ (52.8 kg ha⁻¹) which was followed by hand weeding twice and clomazone - pendimethalin readymix at 1.5 lit ha⁻¹ (Table 1). The increase in nitrogen uptake might be due to effective weed control, less weed DMP which resulted in increased uptake of nutrients. The results are in accordance with the findings of Panneerselvam (1997).

Phosphorus uptake

At 20 DAS, the highest phosphorus uptake was recorded in clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ (1.27 kg ha⁻¹) followed by hand weeding twice (1.05 kg ha⁻¹). At 40 DAS, clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the highest P uptake (11.0 kg ha⁻¹) which was followed by clomazone - pendimethalin readymix at 1.5 lit ha⁻¹. At 60 DAS, hand weeding twice recorded the highest P uptake (14.4 kg ha⁻¹) followed by clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ (13.2 kg ha⁻¹) (Table 2). Better weed control efficiency, lesser weed dry matter production might have resulted in increased uptake of phosphorus. Similar results were reported by Rao and Rao (1992) and Sammuria and Nepalia (1998).

Potassium uptake

Clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the

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Table 1 : Effect of treatments on nitrogen uptake (kg ha^{-1}) by soybean

Trt. No.	Treatments	Dose ha^{-1}	20 DAS	40 DAS	60 DAS
T ₁	Clomazone + Pendimethalin	1.5 lit	3.74	20.1	49.2
T ₂	Clomazone + Pendimethalin	2.0 lit	4.13	23.9	52.8
T ₃	Clomazone + Pendimethalin	3.0 lit	3.66	20.4	39.8
T ₄	Clomazone + Pendimethalin	4.0 lit	2.78	18.8	28.9
T ₅	Clomazone + Pendimethalin	6.0 lit	2.75	16.4	27.6
T ₆	Clomazone + Pendimethalin	8.0 lit	2.68	16.2	27.0
T ₇	Clomazone	500 g	3.18	19.1	45.6
T ₈	Pendimethalin	1000 g	2.99	19.8	42.7
T ₉	Hand weeding twice	-	3.43	20.7	49.2
T ₁₀	Unweeded control	-	2.38	11.1	23.8
	SE(d)		0.18	0.17	0.34
	CD (P=0.05)		0.37	0.34	0.71

Table 2 : Effect of treatments on phosphorus uptake (kg ha^{-1}) by soybean

Trt. No.	Treatments	Dose ha^{-1}	20 DAS	40 DAS	60 DAS
T ₁	Clomazone + Pendimethalin	1.5 lit	0.94	9.20	13.1
T ₂	Clomazone + Pendimethalin	2.0 lit	1.27	11.0	13.2
T ₃	Clomazone + Pendimethalin	3.0 lit	0.61	6.27	11.3
T ₄	Clomazone + Pendimethalin	4.0 lit	0.75	4.34	6.19
T ₅	Clomazone + Pendimethalin	6.0 lit	0.50	4.10	5.91
T ₆	Clomazone + Pendimethalin	8.0 lit	0.48	3.74	5.80
T ₇	Clomazone	500 g	0.87	6.62	12.2
T ₈	Pendimethalin	1000 g	0.54	4.78	12.1
T ₉	Hand weeding twice	-	1.05	8.99	14.4
T ₁₀	Unweeded control	-	0.47	3.70	5.09
	SE(d)		0.007	0.08	1.46
	CD (P=0.05)		0.01	0.17	3.06

Table 3 : Effect of treatments on potassium uptake (kg ha^{-1}) by soybean

Trt. No.	Treatments	Dose ha^{-1}	20 DAS	40 DAS	60 DAS
T ₁	Clomazone + Pendimethalin	1.5 lit	3.43	22.2	42.7
T ₂	Clomazone + Pendimethalin	2.0 lit	3.82	22.1	42.8
T ₃	Clomazone + Pendimethalin	3.0 lit	3.05	18.8	34.8
T ₄	Clomazone + Pendimethalin	4.0 lit	3.03	15.9	24.8
T ₅	Clomazone + Pendimethalin	6.0 lit	2.25	15.0	21.6
T ₆	Clomazone + Pendimethalin	8.0 lit	1.79	13.7	23.2
T ₇	Clomazone	500 g	2.89	19.8	36.5
T ₈	Pendimethalin	1000 g	2.72	19.1	36.6
T ₉	Hand weeding twice	-	2.64	21.6	42.6
T ₁₀	Unweeded control	-	1.90	9.26	18.7
	SE(d)		0.02	0.16	0.31
	CD (P=0.05)		0.05	0.33	0.65

Table 4 : Effect of treatments on yield attributes and seed yield of soybean

Trt. No.	Treatments	Dose ha ⁻¹	Pods plant ⁻¹	100 seed weight (g)	Seed yield (kg ha ⁻¹)
T ₁	Clomazone + Pendimethalin	1.5 lit	56	9.9	1585
T ₂	Clomazone + Pendimethalin	2.0 lit	59	11.3	1643
T ₃	Clomazone + Pendimethalin	3.0 lit	41	9.7	1418
T ₄	Clomazone + Pendimethalin	4.0 lit	40	9.1	1304
T ₅	Clomazone + Pendimethalin	6.0 lit	37	8.4	1273
T ₆	Clomazone + Pendimethalin	8.0 lit	31	8.1	1152
T ₇	Clomazone	500 g	49	8.6	1564
T ₈	Pendimethalin	1000 g	45	8.4	1375
T ₉	Hand weeding twice	-	52	9.9	1627
T ₁₀	Unweeded control	-	15	6.2	553
SE(d)			0.36	0.07	11.9
CD (P=0.05)			0.76	0.16	25.0

highest K uptake at 20 DAS (3.82 kg ha⁻¹) and was followed by clomazone - pendimethalin readymix at 1.5 lit ha⁻¹ (3.43 kg ha⁻¹). At 40 DAS, clomazone - pendimethalin readymix at 1.5 lit ha⁻¹ registered the highest K uptake (22.2 kg ha⁻¹) and was followed by clomazone - pendimethalin readymix at 2.0 lit ha⁻¹. At 60 DAS, clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the highest K uptake (42.8 kg ha⁻¹). The unweeded control recorded the lowest uptake of K at all the stages (Table 3). The increase in nitrogen uptake might be due to effective weed control, less weed DMP which resulted in increased uptake of potassium. The results are in accordance with the findings of Jain and Tiwari (1992) and Panneerselvam (1997).

Yield attributes and Yield

The highest number of 59 pods plant⁻¹ was recorded in clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ followed by clomazone - pendimethalin readymix at 1.5 lit ha⁻¹. The increase in number of pods plant⁻¹ was 75 per cent over control. The clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the highest 100 seed weight of 11.3 g and it was 45 per cent increase over the control. The seed yield for the different treatments ranged from 553 to 1643 kg ha⁻¹. Among the treatments clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ recorded the highest seed yield of 1643 kg ha⁻¹. It showed 66 per cent increase over the control (Table 4). Improved parameters such as plant height and DMP accompanied by and increase in nutrient uptake in the various weed control practices resulted in better yield attributes and increased seed yield. The higher seed yield recorded in clomazone - pendimethalin readymix at 2.0 lit ha⁻¹ might be due to lack of phytotoxicity registered in this treatment and optimal weed control thereby boosting the crop growth, yield parameters and consequently the yield. The results are in agreement with the reports of Nandurkar (1997) and Sammuria and Nepalia (1998).

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Received : November, 2005; Accepted : March, 2006