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Studies on Residual Effect of Atrazine on Germination, Growth and Yield of Greengram in Vertisols of Andhra Pradesh

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Atrazine is the commonly used pre emergence herbicide for weed management in cereals like maize, sorghum, pearl millet, fox tail millet etc. Atrazine usage has increased over the last one decade in cereals like maize and sorghum, gaining sizable area in rice fallows, replacing blackgram and greengram. Atrazine being a member of triazines, residual toxicity in soils is longer and there is an apprehension among farmers as well as scientific community regarding residual toxicity of atrazine applied to cereals on pulse crops in cereal-pulse cropping system. Hence ,this experiment was taken up to study the residual effect of atrazine applied to soil on the succeeding greengram crop, when greengram was sown at six, five, four ,three ,two and one months after atrazine was applied.

A non replicated observational trial was conducted in vertisols at Integrated Weed Management Unit, RARS, Lam, Guntur, A.P., during 2017-18 in with zero tillage (M_1) and shallow tillage (M_2) in main strips and greengram sowings at one, two, three, four, five and six months after atrazine @ 1.0 kg/ha spray (T_1-T_6, respectively) and without atrazine spray (T_7) as control in subplots. Atrazine was sprayed on soil by hand compression sprayer fitted with flood jet nozzle, using a spray fluid of 500 l/ha at monthly intervals starting from July to November, 2017. The field was left fallow till greengram sowing time. Greengram (variety-IPM 2-14) was sown in December, 2017 after removing the weeds manually in zero tillage treatment (M_1) and after shallow tillage by tractor drawn implements in shallow tillage treatment (M_2). The crop was raised by following the recommended package of practices, except chemical weed control and weeds in the trial were controlled manually. Data on seed germination, phytotoxicity on crop, plant height, yield attributes and yield were recorded in different treatments and compared to draw the inferences.

Seed germination of greengram was normal in treatments T_1-T_6(90 per cent or more) in zero tillage (M_1) as well as in shallow tillage (M_2), against 93 percent in zero tillage and 94 percent in shallow tillage in treatment T_7, indicating no effect of atrazine applied one to six months prior to sowing, on seed germination of greengram.

In treatment T_1 where atrazine was applied one month prior to greengram sowing, chlorotic symptoms were recorded in one percent of greengram population at 7 DAS in zero tillage as well as shallow tillage, however by 14 DAS the chlorotic symptoms disappeared (Table.1).

Greengram recorded a dry weight of 18.2-21.3 g/5 plants in T_1-T_6 against 20.7 g/5 plants in T_7 in zero tillage (M_1), and 16.8-19.3 g/5 plants in T_1-T_6 against 19.3 g/5 plants in T_7 in shallow tillage (M_2) at 30 DAS. At 60 DAS a dry weight of 51.9-57.0 g/5 plants was recorded in T_1-T_6 against 58.48 g/5 plants in T_7 in zero tillage (M_1) and 50.6-56.5 g/5 plants was recorded in T_1-T_6 against 56.5 g/5 plants in T_7 in shallow tillage (M_2) (Table.1).

Table 1.Influence of various treatments on seed germination, early vigour and dry weight of green gram

Treatment	Greengram germination (%) @10 DAS		Greengram early vigour				Greengram dry weight of (g/5 plants)			
	Zero tillage (M_1)	Shallow tillage (M_2)	Zero tillage (M_1)		Shallow tillage (M_2)		30 DAS		60 DAS	
			7 DAS	14 DAS	7 DAS	14 DAS	Zero tillage (M_1)	Shallow tillage (M_2)	Zero tillage (M_1)	Shallow tillage (M_2)
T_1-Greengram sowing one month after atrazine spray @ 1.0 kg/ha	(94) Normal	(92) Normal	Chlorosis in 1% populatio	Normal	Chlorosis in 1% populatio	Normal	19.6	17.8	59	52.7
T_2-Greengram sowing two months after atrazine spray @ 1.0 kg/ha	(92) Normal	(90) Normal	Normal	Normal	Normal	Normal	18.2	16.9	51.9	50.6
T_3-Greengram sowing three months after atrazine spray @ 1.0 kg/ha	(95) Normal	(92) Normal	Normal	Normal	Normal	Normal	20.1	18.3	57.1	52.3
T_4- Greengram sowing four months after atrazine spray @ 1.0 kg/ha	(90) Normal	(93) Normal	Normal	Normal	Normal	Normal	20.5	17.2	55.1	51.3
T_5-Greengram sowing five months after atrazine spray @ 1.0 kg/ha	(94) Normal	(90) Normal	Normal	Normal	Normal	Normal	19	17.9	55.9	53.6
T_6-Greengram sowing six months after atrazine spray @ 1.0 kg/ha	(90) Normal	(92) Normal	Normal	Normal	Normal	Normal	21.3	16.8	57.3	53.7
T_7 -Greengram sowing without atrazine spray (control)	(93) Normal	(94) Normal	Normal	Normal	Normal	Normal	20.7	19.3	58.4	56.5

* Germination 90% and above is considered as normal

Table 2. Influence of various treatments on plant height, pod number and grain yield of greengram

Treatment	Plant height (cm)				No. of pods / plant		Grain yield (kg/ha)	
	30 DAS		60 DAS					
	Zero tillage (M_1)	Shallow tillage (M_2)	Zero tillage (M_1)	Shallow tillage (M_2)	Zero tillage (M_1)	Shallow tillage (M_2)	Zero tillage (M_1)	Shallow tillage (M_2)
T_1-Greengram sowing one month after atrazine spray @ 1.0 kg/ha	24.0	21.0	59.0	52.8	17.0	16.4	1371	1333
T_2-Greengram sowing two months after atrazine spray @ 1.0 kg/ha	24.2	22.3	60.0	53.6	16.8	16.2	1389	1315
T_3-Greengram sowing three months after atrazine spray @ 1.0	23.8	20.8	56.3	50.0	16.2	15.8	1333	1278
T_4- Greengram sowing four months after atrazine spray @ 1.0 kg/ha	22.9	22.0	56.2	51.2	15.8	15.2	1315	1259
T_5-Greengram sowing five months after atrazine spray @ 1.0 kg/ha	25.0	19.9	58.0	50.0	16.0	15.0	1333	1241
T_6-Greengram sowing six months after atrazine spray @ 1.0 kg/ha	26.0	22.4	60.2	54.2	17.0	16.6	1408	1352
T_7 -Greengram sowing without atrazine spray (control)	24.0	21.8	58.4	52.3	16.3	15.8	1352	1296

Greengram recorded a plant height of 22.9-26.0 cm in T_1-T_6 against 24.0 cm in T_7 in zero tillage (M_1) and 19.9-22.4 cm in T_1-T_6 against 21.8 cm in T_7 in shallow tillage (M_2) at 30 DAS. At 60 DAS a plant height of 56.2-60.2 cm was recorded in T_1-T_6 against 58.4 cm in T_7 in zero tillage (M_1) and 50.0-54.2 cm was recorded in T_1-T_6 against 52.3 cm in T_7 in shallow tillage (M_2) (Table.2).

The differences among various treatments recorded for plant height and dry matter at 30 and 60 DAS were numerically very low indicating that the plant growth parameters were not influenced by atrazine spray.

No. of pods/plant in treatments T_1-T_6 ranged from 15.8-17.0 against 16.3 in no spray (T_7) in zero tillage (M_1) and 15.0-16.6 against 15.8 in no spray (T_7) in shallow tillage (M_2) (Table.2).

Grain yield in T_1-T_6 ranged from 1315-1408 kg/ha as against 1352 kg/ha in no spray (T_7) in zero tillage (M_1) and 1241-1352 kg/ha in T_1-T_6 against 1296 kg/ha in no spray (T_7) in shallow tillage (M_2) (Table.2).

The variations recorded among the treatments in pods/plant and grain yield were also numerically very low indicating that the yield attributes and yield were also not influenced by atrazine spray.

The results are in agreement with the findings of Buchanan and Hiltbolt 1973 who reported that soil applied atrazine had a short half life of only 20 days and did not show residue toxicity. Verma, Tiwari and Dhemi 2009 reported that atrazine applied to maize did not show any residue effect on crop stand of succeeding greengram. Janaki *et al*, 2012 as well as Nag and Das 2009 reported that atrazine applied to maize did not leave any residues in soils after maize crop harvest.

CONCLUSION

Atrazine @ 1.0 kg/ha has no effect on seed germination, vigour, plant growth, yield attributes and yield of greengram when it was sown either in zero tillage or in shallow tillage one to six months after spray in vertisols of Andhra Pradesh.

LITERATURE CITED

Buchanan G A and Hiltbolt A E 1973 Performance and persistence of atrazine. Weed Science,21 (5):413-416

Janaki P, Neelam Sharma, Chinnusamy C, Shaktivel N and Nitya C 2012 Field persistence of repeated use of atrazine in sandy clay loam soils under maize. Madras Aric.J.99(7-9):533-537

Nag S K and Das S K 2009 Persistence of atrazine in soil under fodder sorghum. Journal of crop science and weed(2):131-135

Sandya Rani B,Chandrika V, Prabhakara Reddy G, Sudhakar P, Nagamadhri K V and Karuna sagar G 2019 Effect of Weed Management Practices in Rabi Maize and their Residual Effect on Succeeding Greengram. International Journal of Current Microbiology and Applied Sciences8(12):831-837

Verma V K, Tiwari A N and Dhemi S 2009 Effect of atrazine on weed management in winter maize-greengram cropping system in central plains zone of Uttar Pradesh. Indian Journal of weed Science41(1&2):41-45

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