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Effect of Herbicides Applied with and without Manures on Physical Soil Properties of Summer Pearl Millet

Vikas G Damor[1], Kalpesh P Bhuriya[2]*, Vishal Nagar[2] and Prabhu Dayal Kumawat[2]

[1]Agriculture, Farmers Welfare and Co-operation Department, Govt. of Gujarat, India
[2]Main Sugarcane Research Station, Junagadh Agricultural University, Kodinar, Gujarat, India

**Corresponding author*

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A B S T R A C T

The present investigation was undertaken to study the "Effect of herbicides applied with and without manures on physical soil properties of summer pearl millet crop" was carried out during *summer* season of the year 2011-12, at the AICRP on weed control farm, B. A. College of agriculture, Anand Agricultural University, Anand. The water holding capacity of soil found the higher under the treatment of farm yard manure@ 10 t ha-1 (M1) fb vermicompost @ 3 t ha-1(M2). Water holding capacity of soil was through not significantly influenced by either application of FYM or vermicompost at 1 DAS and at harvest and application of herbicide was found to be non-significant with respect to soil WHC at one DAS as well as at harvest. Interaction effect of manures and herbicide with respect of WHC was found non-significant. Bulk density was found non- significant with application of manures and also with application of herbicide found non- significant. Interaction effect of with or without manures and herbicides treatments was found non-significant with respect to soil bulk density at one DAS as well as at harvest.

Introduction

Pearl millet (*Pennisetum glaucum* L.) is the most widely grown type of millet which is originated in Africa and introduced in India since prehistoric times. Pearl millet is the fourth most important food grain crop in India after rice, wheat and sorghum and ranked sixth in the world following wheat, rice, maize, barley and sorghum. Cultivation of pearl millet is mainly followed during *kharif* season across the country. India ranks first both in production and an area of pearl millet. In India, it is cultivated over an area of 9.1 million hectares with a production of 9.5 million tones with the productivity of 1044 kg ha-1. States of Gujarat, Rajasthan, Uttar Pradesh and Haryana account for 87 per cent of total area. Summer pearl millet is popular in Gujarat State with very high yield exceeding 2276 kg ha-1 during 2009-10 with excellent grain quality. Gujarat ranks third in the production of pearl millet in India

whereas Rajasthan tops the list and Maharashtra is in second position. It is cultivated over an area of 4.810 lakh ha in Gujarat. The total production of pearl millet in Gujarat state is 4.880 lakh tones and the productivity is 998 kg ha-1 (Anon., 2011).

In modern agriculture, emphasis is laid on increasing production per unit area per unit time with the increased use of herbicides and fertilizers. Incorporation of farm yard manure or vermicompost is an effective method to mitigate the residual toxicity of herbicide. Application of farm yard manure or compost helps to absorb the herbicide molecule in their colloidal fraction and make them unavailable for crops and weeds.

The magnitude of crop yield loss due to weed infestation was estimated more than 55 percent depending on composition of weed flora, period of crop-weed competition and its intensity (Banga *et al.*, 2000). Hence for keeping weeds under check and boosting the production, herbicides such as atrazine is widely and successfully employed in pearl millet crop.

Oxyflourfen is also recommended for weed management in pearl millet as pre-emergence. Ideally, herbicide should control or eradicate the target species selectively in ecosystem, remain active at the site of application for desired period and degrade rapidly once its purpose is achieved. The environmental fate of herbicide in soil depends on soil properties like clay content and organic matter present in soil and agronomic practices like dose of herbicide, time and method of its application.

Materials and Methods

The field experiment was carried out at AICRP on Weed Control Farm, B.A. College of Agriculture, Anand Agricultural University, Anand on the "Effect of herbicides applied with and without manures on physical soil properties of summer pearl millet crop" during summer season of the year 2011-12.The experimental plot was prepared as per the method described by Kharadi *et al.,* (2020). The experiment was laid out Randomized Block Design (Factorial) with no. of treatments 15. Among Organic manure, farm yard manure was applied @ 10 t ha-1 and 3 t vermicompost ha-1 and compared with no manure (control). Weed Management H1: Atrazine @ 500 g ha-1 as pre emergence, H2: Atrazine @ 1000 g ha-1 as pre emergence, H3: Oxyflourfen @ 80 g ha-1 as pre emergence, H4: Oxyflourfen @ 100 g ha-1 as pre emergence, H5: IC fb HW at 20 and 40 DAS (Non chemical control). Soil samples were collected at 1 and 30 DAS and at harvest from the surface soil using pipe auger and collected in polyethylene bags and immediately preserved in deep freezer (-10˚C) till analysis. Water holding capacity and bulk density of soil were determined by using standard methods from soil at 1 DAS and at harvest.

Results and Discussion

Effect of manures on water holding capacity of soil

It was observed from the data presented in (Table 1) revealed that water holding capacity of soil was influenced by application of manures at one day after spraying (DAS) and at harvest.

The water holding capacity of soil found the higher under the treatment of farm yard manure@ 10 t ha-1 (M1) fb vermicompost @ 3 t ha-1(M2). Water holding capacity of soil was through not significantly influenced by either application of FYM or vermicompost at 1 DAS and at harvest. The results are in close conformity with the findings of Sharma *et al.*, (2003).

Subhan *et al.*, (2017) reported that the post – harvest bulk density from each plot showed non – significant effect in the first year, while second year showed significant influence on the bulk density of soil. The application of organic amendments was effective in reducing the bulk density of soil. The cattle manure gave significantly lower bulk density over the rest of the treatments in the second years.

Effect of herbicides on water holding capacity of soil

In this trial data presented in Table 1 revealed that application of herbicide was found to be non-significant with respect to soil WHC at one DAS as well as at harvest. This result is in agreement with the findings of Meena (2009). The bulk density, water holding capacity and moisture content of soil did not vary after harvesting of potato leaves (60 DAA) due to application of herbicide oxyfluorfen 23.5%EC as compared to before application of treatments. This result is in finding agreement with the finding of Bera & Ghosh (2014). Based on the results, soil physico-chemical properties did not differ significantly under different treatments (Bera and Ghosh, 2013).

Interaction effect on water holding capacity of soil

The interaction effect of manures and herbicides with respect to WHC of soil at one DAS as well as at harvest was found to be non-significant.

Table.1 Effect of herbicides with or without manures on water holding capacity (%) and bulk density (g cc^{-1}) of soil.

Treatments	Sampling periods WHC(%)		Sampling periods Bulk density (g cc^{-1})	
	One DAS	At Harvest	One DAS	At Harvest
Manures (M)				
M_0 :control (No manure)	37.44	36.68	1.32	1.31
M_1 : 10 t FYM ha^{-1}	39.06	37.94	1.29	1.31
M_2 : 3 t vermicompost ha^{-1}	38.17	37.09	1.29	1.30
S.Em. ±	1.00	0.97	0.02	0.02
C.D. at 5 %	NS	NS	NS	NS
Herbicides (H)				
H_1 : Atrazine @ 500 g ha^{-1} aspre emergence	38.37	37.66	1.31	1.31
H_2 : Atrazine @ 1000 g ha^{-1} as pre emergence	39.07	38.45	1.30	1.29
H_3 : Oxyflourfen @ 80 g ha^{-1} as pre emergence	37.20	36.48	1.28	1.30
H_4 : Oxyflourfen @ 100g ha^{-1} as pre emergence	36.90	36.24	1.28	1.28
H_5 : IC *fb* HW at 20 and 40 DAS (Non chemical control)	39.58	37.35	1.26	1.27
S.Em. ±	1.29	1.25	0.03	0.03
C.D. at 5 %	NS	NS	NS	NS
Interaction (M x H)	NS	NS	NS	NS
C V %	10.1	10.1	7.2	6.2

Effect of manures on bulk density of soil

The results Table 1 revealed that there were non-significant differences in bulk density of soil under various applications of manures at one DAS and at harvest of the crop. However, bulk density of soil was slightly lower recorded at both the sampling in soil under the application of FYM as well as in the application of vermicompost. Similar results were also obtained by Srikanth *et al.,* (2000) at Bangalore. They found slight decrease in the bulk density where vermicompost or farm yard manure was amended in soil over inorganic fertilizers.

Mbagwu (1992) observed decline in bulk density by applying the rice-shaving and poultry manure. He reported that soil applied with these amendments enhanced the organic matter which reduced the soil compaction. Mbah and Onweremadu (2009) found lower bulk density of soil treated with organic amendments as poultry litter and rice husk over the inorganic fertilization.

Effect of herbicides on bulk density of soil

The data presented in Table 1 showed that the differences in bulk density among the herbicidal treatments at one day after spraying and at harvest were non-significant. However slightly higher bulk density was found under the herbicidal treatments as compared to non-herbicidal treatments at both the sampling interval. These results are in conformity with the findings of Haynes (1981) and Meena (2009). The bulk density, water holding capacity and moisture content of soil did not vary after harvesting of potato leaves (60 DAA) due to application of herbicide oxyfluorfen 23.5% EC as compared to before application of treatments. This result is in finding agreement with the finding of Bera & Ghosh (2014).Based on the results, soil physico-chemical properties did not differ significantly under different treatments (Bera and Ghosh, 2013).

Interaction effect on bulk density of soil

The interactive effect of manures and herbicides on soil bulk density was found to be non-significant.

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