

## Effect of herbicides with and without FYM on soil properties and residues in potato field

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### ABSTRACT

Soil microbial population in soil was suppressed due to application of metribuzin 0.35 kg/ha and fluchloralin 1.0 kg/ha, but simultaneous application of FYM (10 t/ha) supported the proliferation of microbial population. Bacterial population was significantly declined due to application of herbicides at 1<sup>st</sup> and 7<sup>th</sup> day of spraying, while fungal and actinomycetes population were significantly declined at 1<sup>st</sup>, 7<sup>th</sup> and 15<sup>th</sup> day of spraying. No significant change was observed in soil pH, electrical conductivity, available phosphorus and available potassium due to application of fluchloralin or metribuzin alone or with 10 t FYM/ha at harvest while nitrogen content was significantly changed. Total nitrogen content of the soil was significantly the highest in application of fluchloralin with FYM. Fluchloralin residues were gradually reduced with time. FYM application supported the fluchloralin decomposition.

**Key words :** Potato, Fluchloralin residue, FYM, Microbial population.

Under modern farming system, use of pesticides including herbicide to combat agricultural pests and weeds are common. Due to increase in labour cost, herbicide has been commonly preferred by farmers to keep weeds under check for better agricultural production. Most of the herbicides are applied to soil as pre-emergence or pre-plant and poses environmental hazards due to the presence of their residues in soil. Potato is one of the important vegetable crops of the state and fluchloralin and metribuzin herbicides are recommended for weed management in potato crop. Therefore, in the present investigation their effect on soil microbial, chemical composition and residues has been assessed at different time intervals at crop growth.

### MATERIALS AND METHODS

A field experiment was conducted during *Rabi* season of 2002-03 under AICRP on Weed Control at agricultural farm, Anand to know the effect of applied herbicides with and without farm yard manure (FYM) on soil properties and their left over residues in soil with potato crop. Experimental design was Randomized Block Design with four replications. The soil at the experimental site was sandy loam in nature with pH 7.78, low in organic carbon (0.473%), high in P<sub>2</sub>O<sub>5</sub> (73 kg/ha) and K<sub>2</sub>O (386 kg/ha). Treatments consisted of fluchloralin (1.0 kg/ha) and metribuzin (0.35 kg/ha) applied alone and with FYM

(10 t/ha). A hand weeding control (hand weeding at 20 and 40 Days after transplant) was also included. Herbicides were applied by using a volume spray of 500 l water/ha with the help of Knapsack sprayer fitted with flat-fan nozzle. Fluchloralin residues and microbial population (total bacteria, fungi and actinomycetes) were analyzed at 1(24 hours after spraying), 7, 15 and 30 DAT and at harvest from plough layer soil. For microbial population, soil samples were analyzed for enumeration of total population of bacteria, fungi and actinomycetes using dilution technique. Ten fold serial dilutions were made in sterile distilled water and suitable dilutions were plated using streptomycin potato dextrose agar (PDA), nutrient agar (N-agar) and spread plate method for fungi, bacteria and actinomycetes, respectively. Microbial population is expressed as colonies forming units per gram of soil. Fluchloralin residues were estimated using method described by Patel *et al.* (1996). Physico chemical properties of soil were analyzed at harvest following usual methods.

### RESULTS AND DISCUSSION

#### Effect of herbicides on soil microbial population

Total bacterial population in soil was significantly checked due to application of both the herbicides up to seven days while fungi and actinomycetes up to fifteen

days from the day of spraying (Table 1). Herbicides exhibit varying degree of inhibitory effects on soil micro organisms which in turn interact with them and show adoptive mechanisms. Sidhu *et al.* (1985) have also reported suppression of soil micro flora upto 7 days due to fluchloralin application. Addition of FYM 10 t/ha significantly supported the microbial population as compared to herbicide alone.

### Effect of herbicides on Soil properties

Physico chemical properties of soil at harvest viz., pH, electrical conductivity, available phosphorus and available potassium were not affected due to application of fluchloralin or metribuzin with or without FYM of soil at harvest (Table 2). Total nitrogen content was significantly better with application of fluchloralin and

**Table 1. Effect of herbicides and FYM on microbial population at various intervals in sandy loam soil**

Treatments	Sampling intervals (days after spraying)				At harvest (90 DAS)
	1	7	15	30	
<b>Bacteria (x 10<sup>5</sup>/g soil)</b>					
Fluchloralin 1.0 kg/ha	8.00	10.50	11.15	11.12	8.87
Fluchloralin + 10 t FYM/ha	10.38	12.00	11.75	11.37	8.77
Metribuzin 0.35 kg/ha	7.75	9.88	10.82	10.87	8.86
Metribuzin 0.35 kg/ha + 10 t FYM/ha	9.65	11.47	12.00	11.75	9.00
Control (Non Chemical)	10.75	12.25	12.15	12.75	8.87
LSD (P=0.05)	1.22	0.80	NS	NS	NS
<b>Fungi (x10<sup>3</sup>/g soil)</b>					
Fluchloralin 1.0 kg/ha	4.75	5.25	7.45	6.6	6.33
Fluchloralin + 10 t FYM/ha	5.78	5.75	8.25	6.55	6.40
Metribuzin 0.35 kg/ha	6.32	6.57	8.20	6.75	6.55
Metribuzin 0.35 kg/ha + 10 t FYM/ha	6.80	7.50	8.52	6.95	6.65
Control (Non Chemical)	8.25	8.30	8.95	6.93	6.78
LSD (P=0.05)	0.30	0.43	0.43	NS	NS
<b>Actinomycetes (x10<sup>5</sup> g soil)</b>					
Fluchloralin 1.0 kg/ha	2.1	3.4	4.5	5.1	6.3
Fluchloralin + 10 t FYM/ha	2.5	4.5	5.2	5.7	6.5
Metribuzin 0.35 kg/ha	1.9	4.1	4.3	4.8	6.5
Metribuzin 0.35 kg/ha + 10 t FYM/ha	2.0	4.3	4.9	4.8	6.5
Control (Non Chemical)	2.9	4.4	4.5	5.0	6.5
LSD (P=0.05)	0.4	0.6	0.5	NS	NS

**Table 2. Physico-chemical properties of the soil after harvest of potato**

Treatments	pH	EC	Total Nitrogen (%)	P <sub>2</sub> O <sub>5</sub> (kg/ha)	K <sub>2</sub> O (kg/ha)
Fluchloralin 1.0 kg/ha	8.11	0.127	0.026	56.58	350
Fluchloralin + 10 t FYM/ha	7.05	0.127	0.031	59.12	358
Metribuzin 0.35 kg/ha	7.93	0.122	0.023	53.29	349
Metribuzin 0.35 kg/ha + 10 t FYM/ha	7.78	0.126	0.026	53.50	352
Control (Non Chemical)	8.15	0.125	0.025	54.35	350
LSD (P=0.05)	NS	NS	0.003	NS	NS

10 t FYM/ha. Palaniappan and Balasubramanian (1986) reported increased NO<sub>3</sub>-N content in different soils due to the application of fluchloralin.

**Herbicide residues**

Fluchloralin residues (Table 3) in surface soil were gradually reduced upto the crop harvest. FYM application was found more effective in decomposing the herbicides

**Table 3. Fluchloralin residues (ppm) in sandy loam soil under potato crop at various intervals**

Days after spraying	Fluchloralin 1.0 kg/ha without FYM	Fluchloralin 1.0 kg/ha with 10 t FYM/ha
1	0.484	0.406
7	0.352	0.231
15	0.252	0.158
30	0.104	0.053
At harvest	0.004	0.001

at different stages. Fluchloralin residues were lower at all the intervals in soil under the application of fluchloralin with 10 t FYM/ha as compared to fluchloralin applied alone. Patel *et al.* (1996) reported 50 percent reduction in residue of fluchloralin due to incorporation of FYM 30 t/ha in sandy loam soil which was nontoxic to mustard crop.

So it is concluded that ill effects of herbicides on soil properties can be minimized by integrating FYM.

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