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Effect of Methods of Herbicide Application on Weeds and Okra [*Abelmoschus esculentus* (L.) Moench]

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Okra is one of the most popular vegetables in tropical and sub-tropical region. Okra suffers heavy yield losses in rainy season **(kharif)** due to weed infestation owing to congenial environmental conditions for luxurious weed growth coupled with wider row spacing and slow growth at early stages. Yield losses due to weeds varied from 40 to 80%, depending on the type of weed flora, their intensity and stage. Due to scarcity of manpower at critical period of crop-weed competition, the manual weeding is difficult for removal of weeds. Moreover, manual weeding is time consuming and expensive due to high labour cost near city area. Unavailability of labour at the peak time and sometimes unfavourable field conditions do not permit manual weedings. It was, therefore, considered necessary to undertake a study to find out appropriate herbicide for okra.

Field experiment was conducted at AICRP on Weed Control, Gujarat Agricultural University, Anand during **kharif** seasons of 1999, 2000 and 2001. The soil of the experimental field was sandy loam in texture, alkaline in reaction, low in nitrogen, medium in available phosphorus and high in potassium. A set of 12 treatments, comprising pre-emergence and pre-plant incorporation of alachlor, fluchloralin and trifluralin, pre-emergence of pendimethalin, metolachlor and butachlor each at 1.0 kg ha^{-1}, two hand weedings (3 and 6 weeks after sowing), three hand weedings (3, 6 and 9 weeks after sowing) and weedy check was laid out in randomized block design with four replications (Table 1). Gujarat hybrid Okra-1 was sown at a spacing of 45 cm x 30 cm in July during all the seasons. All the recommended package of practices were adopted to raise the crop except weed control. Marketable size green okra fruits were picked up. Crop received total rainfall of 425.2, 431.7 and 709.4 mm in 23, 26 and 37 rainy days during 1999, 2000 and 2001, respectively. Dry weed weight was recorded at 45 days after sowing and at harvest.

Weed species in the experimental field were *Echinochloa crusgalli* (16.9%), *Eleusine indica* (16.0%), *Dactyloctenium aegyptium* (14.2%), *Digera arvensis* (9.2%), *Commelina benghalensis* (8.8%), *Amaranthus viridis* (8.2%), *Trianthema monogyna* (6.7%), *Phyllanthus niruri, Cyperus rotundus, Eragrostis major, Euphorbia hirta* and *Mollugo nudicaulis.* Minimum dry weight of weeds was observed in three hand weedings treatment which was at par with all the herbicidal treatments except alachlor (1.0 kg ha^{-1}) applied as pre-plant or pre-emergence and metolachlor (1.0 kg ha^{-1}) applied as pre-emergence in pooled analysis at 45 DAS. Same trend was noticed in dry weed biomass recorded at harvest but alachlor and metolachlor were at par in pooled analysis. Among herbicidal treatments, more than 80% weed control efficiency was recorded at 45 DAS in application of pendimethalin, fluchloralin, trifluralin and butachlor applied as pre-emergence.

Phytotoxicity symptoms were not seen due to application of any herbicide. Okra fruit yield was significantly increased in all the treatments as compared to weedy check (Table 1). Significantly higher fruit yield was recorded in three hand weedings done at 3, 6 and 9 WAS, which was at par with two hand weedings done at 3 and 6 WAS, pre-emergence application of pendimethalin (1.0 kg ha^{-1}) and fluchloralin (1.0 kg ha^{-1}) in pooled analysis.

Additional profit over control was higher with three hand weedings followed by two hand weedings and pendimethalin at 1.0 kg ha^{-1} as pre-emergence.

Table 1. Effect of treatments on weeds, okra fruit yield and economics

Treatment	Stage of application	Dry weight of weeds		Fruit yield (t ha^{-1})				Additional profit over control (Rs. ha^{-1})
		At 45 DAS (g m^{-2}) Pooled	At harvest (kg ha^{-1}) Pooled	1999	2000	2001	Pooled	
Alachlor	PPI	150.2	705	10.17	10.72	10.75	10.55	2240
Alachlor	Pre	102.8	542	11.16	10.84	11.34	11.11	5710
Fluchloralin	PPI	67.4	465	11.55	12.43	11.69	11.89	9646
Fluchloralin	Pre	59.8	417	12.73	12.48	11.75	12.32	12288
Trifluralin	PPI	69.5	565	12.77	12.10	11.55	12.14	11134
Trifluralin	Pre	64.5	474	12.30	11.59	11.53	11.80	9210
Pendimethalin	Pre	50.5	353	12.81	12.66	11.72	12.40	12258
Metolachlor	Pre	97.8	785	11.70	9.96	11.41	11.02	4662
Butachlor	Pre	65.5	702	12.21	11.46	11.36	11.67	9120
HW 3 and 6 WAS	-	34.3	316	12.98	13.06	12.37	12.80	15236
HW 3, 6 and 9 WAS	-	25.2	216	13.07	13.20	12.55	12.94	15282
Weedy	-	327.1	3398	10.05	9.48	10.15	9.89	-
LSD (P=0.05)	-	44.4	627	0.48	0.50	0.67	0.78	-