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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 preemergence 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, preemergence 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 preemergence.

tage of	Dry weigh	t of weeds		Fruit yiel	d (t ha ⁻¹)		Additional
dication			6661	2000	2001	Pooled	profit over
	At 45 DAS	At harvest					control
	(g m²) Pooled	(kg ha ⁻ⁱ) Pooled					(Rs. ha ⁻¹)
Idd	150.2	705	10.17	10.72	10.75	10.55	2240
Pre	102.8	542	11.16	10.84	11.34	11.11	5710
Idd	67.4	465	11.55	12.43	11.69	11.89	9646
Pre	59.8	417	12.73	12.48	11.75	12.32	12288
Idd	69.5	565	12.77	12.10	11.55	12.14	11134
Pre	64.5	474	12.30	11.59	11.53	11.80	9210
Pre	50.5	353	12.81	12.66	11.72	12.40	12258
Pre	97.8	785	11.70	96.6	11.41	11.02	4662
Pre	65.5	702	12.21	11.46	11.36	11.67	9120
ų	34.3	316	12.98	13.06	12.37	12.80	15236
	25.2	216	13.07	13.20	12.55	12.94	15282
•	327.1	3398	10.05	9.48	10.15	9.89	
-	44.4	627	0.48	0.50	0.67	0.78	. 1
	age of lication Pre Pre Pre Pre Pre Pre Pre -	age of Dry weigh lication At 45 DAS (g m ²) Pooled 150.2 Pre 102.8 Pre 67.4 Pre 64.5 Pre 64.	lage of Dry weight of weeds Alication At 45 DAS At harvest (g m²) (kg ha¹) PPI 150.2 705 PPI 150.2 705 PPI 150.2 705 Pre 102.8 542 PPI 150.2 705 Pre 102.8 542 Pre 67.4 465 Pre 69.5 565 Pre 64.5 474 Pre 50.5 353 Pre 65.5 702 Pre 50.5 356 Pre 50.5 353 Pre 50.5 333 Pre 55.2 216 - 25.2 216 - 25.2 216 - 24.4 627	lage ofDry weight of weedslication 1999 hicationAt 45 DASAt harvest $(g m^2)$ $(kg ha^4)$ PPI 150.2 705 PPI 10.17 Pre 67.4 465 PPI 102.8 542 PPI 102.8 542 Pre 69.5 565 Pre 69.5 565 Pre 69.5 353 Pre 64.5 772 Pre 65.5 702 Pre 55.2 216 25.2 216 <t< td=""><td>lage of licationDry weight of weedsFruit yielAlication$1999$$1999$$2000$Alication$At 45 DAS$$At harvest$$1999$$2000$$At 45 DAS$$At harvest$$(kg ha^4)$$10.72$$10.72PPI150.2$$705$$10.17$$10.72PPI150.2$$705$$10.17$$10.72Pre102.8$$542$$11.16$$10.84PPI150.2$$705$$12.73$$12.43Pre67.4$$465$$11.55$$12.43Pre69.5$$565$$12.77$$12.10Pre69.5$$565$$11.77$$12.10Pre69.5$$565$$11.70$$9.96Pre66.5$$702$$12.21$$11.46Pre65.5$$702$$12.21$$11.46Pre65.5$$702$$12.21$$11.46Pre65.5$$702$$12.21$$11.46Pre55.2$$216$$13.07$$13.20Pre25.2$$216$$13.07$$13.20Pre25.2$$216$$13.07$$13.20Pre25.2$$216$$13.07$$13.20Pre25.2$$216$$13.07$$13.20Pre25.2$$216$$13.07$$13.20Pre25.2$$216$$10.05$$9.48Pre25.7$$0.48$$0.50$</td><td>lage of IncationDry weight of weedsFruit yield (tha⁻¹)AlicationAt 45 DAs (g m⁻¹)At harvest199920002001At 45 DAs (g m⁻¹)At harvest199920002001At 45 DAs (g m⁻¹)(kg ha⁻¹)(kg ha⁻¹)10.1710.75PPI150.270510.1710.7210.75Pre150.270510.1710.7210.75Pre102.854.211.1610.8411.34PPI150.256.512.7312.4311.69Pre69.556.512.7712.1011.55Pre69.556.512.7312.4811.75Pre69.556.512.7312.4811.75Pre69.556.512.7112.1011.55Pre97.870212.3011.5911.75Pre65.570212.2111.4611.36Pre65.570212.2111.4611.75Pre65.570212.9813.0612.37Pre65.570212.9813.0612.37Pre55.221613.0713.2012.55Pre327.1339810.059.4810.15Pre65.70.480.500.670.67</td><td>tage of trait by weight of weedsFruit yield (t ha⁻¹)licationAt 45 DAS (g m⁻¹)199920002001At 45 DAS (g m⁻¹)At harvest (g m⁻¹)199920002001At 45 DAS (g m⁻¹)At harvest (g m⁻¹)10.1710.7210.55PPI150.270510.1710.7210.7510.55Pre102.854.211.1610.8411.1611.3411.11PPI67.446511.5512.4311.6911.89PPI67.556512.7712.4811.7512.32PPI69.556512.7712.1011.5512.40Pre50.535312.8112.6611.7512.32Pre97.878511.7099611.7312.40Pre65.570212.2111.4611.6711.67Pre50.533312.9813.0612.3712.80Pre97.873813.0713.26611.7212.94Pre34.331612.9813.0612.5512.94Pre327.1339810.059.4810.159.89-44.46270.480.500.670.78</td></t<>	lage of licationDry weight of weedsFruit yielAlication 1999 1999 2000 Alication $At 45 DAS$ $At harvest$ 1999 2000 $At 45 DAS$ $At harvest$ $(kg ha^4)$ 10.72 10.72 PPI 150.2 705 10.17 10.72 PPI 150.2 705 10.17 10.72 Pre 102.8 542 11.16 10.84 PPI 150.2 705 12.73 12.43 Pre 67.4 465 11.55 12.43 Pre 69.5 565 12.77 12.10 Pre 69.5 565 11.77 12.10 Pre 69.5 565 11.70 9.96 Pre 66.5 702 12.21 11.46 Pre 65.5 702 12.21 11.46 Pre 65.5 702 12.21 11.46 Pre 65.5 702 12.21 11.46 Pre 55.2 216 13.07 13.20 Pre 25.2 216 10.05 9.48 Pre 25.7 0.48 0.50	lage of IncationDry weight of weedsFruit yield (tha ⁻¹)AlicationAt 45 DAs (g m ⁻¹)At harvest199920002001At 45 DAs (g m ⁻¹)At harvest199920002001At 45 DAs (g m ⁻¹)(kg ha ⁻¹)(kg ha ⁻¹)10.1710.75PPI150.270510.1710.7210.75Pre150.270510.1710.7210.75Pre102.854.211.1610.8411.34PPI150.256.512.7312.4311.69Pre69.556.512.7712.1011.55Pre69.556.512.7312.4811.75Pre69.556.512.7312.4811.75Pre69.556.512.7112.1011.55Pre97.870212.3011.5911.75Pre65.570212.2111.4611.36Pre65.570212.2111.4611.75Pre65.570212.9813.0612.37Pre65.570212.9813.0612.37Pre55.221613.0713.2012.55Pre327.1339810.059.4810.15Pre65.70.480.500.670.67	tage of trait by weight of weedsFruit yield (t ha ⁻¹)licationAt 45 DAS (g m ⁻¹)199920002001At 45 DAS (g m ⁻¹)At harvest (g m ⁻¹)199920002001At 45 DAS (g m ⁻¹)At harvest (g m ⁻¹)10.1710.7210.55PPI150.270510.1710.7210.7510.55Pre102.854.211.1610.8411.1611.3411.11PPI67.446511.5512.4311.6911.89PPI67.556512.7712.4811.7512.32PPI69.556512.7712.1011.5512.40Pre50.535312.8112.6611.7512.32Pre97.878511.7099611.7312.40Pre65.570212.2111.4611.6711.67Pre50.533312.9813.0612.3712.80Pre97.873813.0713.26611.7212.94Pre34.331612.9813.0612.5512.94Pre327.1339810.059.4810.159.89-44.46270.480.500.670.78

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

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