Indian Journal of Weed Science **46**(3): 247–250, 2014

Increase in growth and yield of cassava with weed management

Deo Shankar*, Adikant Pradhan and M.S. Paikra
S.G. College of Agriculture and Research Station, Jagdalpur, Chhattisgarh 494001

Received: 13 October 2013; Revised: 30 November 2013

ABSTRACT

The experiment comprising 10 weed management practices of different herbicidal combinations along with hand weeding were conducted on light textured soil of Jagdalpur as rainfed in *Kharif* season 2011 and 2012 on Tubers. *Digitaria sangunalis, Eleusine indica, Setaria gluaca, Cyperus compressus* and *Echinochloa colona* among monocots whereas broad leaved weeds, *viz. Celosia argentea, Commelina benghalensis, Spilanthus acmella* and *Euphorbia geniculata* were found rampant weeds. Irrespective of weeds management practices, density and dry weight of weeds and weed control efficiency were significant under four hand weeding (1,2,3 and 4 month after planting). The growth and yield attributes of cassava over weedy check were also higher in same treatment over weedy check.

Key words: Cassava, Tuber crop, Tapioca, Weed management

Cassava also known as tapioca (*Manihot esculenta* Crantz) is the largest source of dietary carbohydrates in the tropical and subtropical part after rice, wheat and maize. Cassava root is poor source of protein but ins spite of that is a major staple food in the developing world, providing a basic diet for over half a billion people. It is one of the most drought tolerant crops, capable of growing on marginal lands (Ugwu 1996). Farmers often prefer cassava because this is non-preferred to be attacked by pests, animals and thieves. Information about weed management in cassava is meager in spite of the fact that it has assumed as industrial crop in India being grown in large areas due to easy cultivation on marginal and poor land. Therefore, present experiment was carried out to study the effect of herbicides and their integration with other methods for obtaining higher yield of casava.

MATERIALS AND METHODS

The experiment was conducted comprising 10 weed management practices with different herbicidal and hand weeding combinations in 5 x 5 m plots with three replications on light textured soil of S.G. College of Agriculture and Research Station, Jagdalpur (Chhattisgarh) during *Kharif* season 2011 and 2012. The treatments comprised of oxyflorfen 0.06 kg/ha (pre-emergence), oxyflorfen 0.06 kg/ha (pre-emergence) + 1 hand weeding (3 months after planting), oxyflorfen 0.06 kg/ha (pre-emergence) + 2 hand weeding (2 and 3 months after planting), glyphosphate 2.0 kg/ha (pre-emergence 1 month after planting), one hand weeding (1 month after planting) + glyphosphate 2.0 kg/ha (pre-emergence, 2 months after planting), two hand weeding (1 and 2 months after planting) + glyphosphate 2.0 kg/ha (post-emergence 3 months after planting), four hand weeding (1, 2 3 and 4 months after planting), two hand weeding (1 and 2 months after planting), weedy check and black polythene mulch under randomized block design with four replications. The soil was medium in available N (260 kg/ha) and P (15 kg/ha), high in available K (290 kg/ha) with pH 6.5 in reaction. Cassava variety "*Sreevishakhum*" stem cuttings was planted on 26 June, 2011 and 28 June 2012 in 75 cm apart and cuttings were placed in opened ditches and gaps were maintained by planting sprouted cuttings to obtain proper plant population. Half dose of nitrogen (50 kg/ha) and full dose of P and K (60 and 40 kg/ha) were applied as basal and remaining half of nitrogen (30kg/ha) was top dressed one month later. Oxyfloufen was incorporated just after sowing. Plant protection measures were followed as per recommendation. Weed counts (number/m^2) and dry weight (g/m^2) were recorded by putting a quadrate (0.25 m^2) at five random spots in each plot at 30 DAS and harvesting. The data were recorded for growth, yield and economics and statistically analyzed. Data on weed density and dry weight of weeds were transformed using square root transformation $\sqrt{x+0.5}$ before statistical analysis (Panse and Sukhatme 1967). Weed control efficiency (WCE) was also calculated on the basis of dry matter production of weeds.

RESULTS AND DISCUSSION

Weeds

The major grass and sedge weeds of experimental field consisted of *Setaria gluaca, Cyperus rotundus*,

***Corresponding author:** deo1975ram@gmail.com

Digitaria sangunalis, Eleusine indica and *Echinochloa colona*. Among broad leaved weeds, *Spilanthes acmella, Celosia argentea, Commelina benghalensis, Euphorbia geniculata* were more rampant. Irrespective of weeds management practices, density, dry weight and weed control efficiency were higher in four hand weeding (at 1,2,3 and 4 month after sowing). The crop duration was 6 month and tuber formation started from third month after planting. This required nutrition to develop tuber properly that is why gave good tuber yield as compared to other hand weeding alone over other treatments except black polythene mulch and two hand weeding at 1 and 2 month after planting + protected application of glyphosate 2.0 kg/ ha. The crop experienced severe weed competition in single application of oxyflourfen or glyphosate having nominal WCE (52.68, 56.17; 38.50, 40.32 and 16.25, 18.48% for oxyflourfen 0.06 kg/ha and 44.86, 48.35; 33.50, 33.83 and 12.57, 14.25%) which might be due to unfavourable conditions leading to vigorous growth of weeds (Cadavid *et al.* 1998). Among herbicidal treatments, oxyflourfen 0.06 kg/ha (pre-emergence) was found better than glyphosate 2.0 kg/ha alone. (Scott *et al.* 2000). All the weed management practices caused significant reduction in density, dry weight of weeds in comparison to weedy check plot (Table 1 and 2). In general, weed management practices reduced weed density from 0.00 to 6.00 weeds/m^2 under monocots and 0.00 to 4.00 g/m^2 in dicot during both the years. However, lowest density (0.00) and dry weight (0.00) of weeds were recorded under hand weeding followed by black polythene mulch throughout growing period (6.30, 32.68; 3.20, 11.30; 35.22, 4.55; as density and 1.50, 11.50; 5.50, 2.60; 3.12, 1.92). Similarly, plot receiving four hand weeding (at 1, 2,3 and 4 month after sowing) registered the highest weed control efficiency (69.52, 73.65,; 47.76, 56.24; 48.10, 57.63% in 2011 and 2012 on grasses, broad leaved weeds and sedges, respectively) and followed by black polythene mulch which showed the effective control of weeds and lowest in alone application of herbicides and hand weeding. Similar results

Table 1. Influence of integrated weed management on density and dry matter accumulation of weeds

Treatment	Density of weed (number/m^2)						Dry weight of weed (g/m^2)					
	Grasses		BLWs		Sedges		Grasses		BLWs		Sedges	
	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012	2011	2012
Two HW (1 and 2 months after planting)	13.87	26.68	1.30	18.87	29.22	2.65	3.19	2.89	7.19	4.34	4.50	3.30
	(3.79)	(4.14)	(1.34)	(4.40)	(5.45)	(1.77)	(1.92)	(1.84)	(2.77)	(2.20)	(2.24)	(1.95)
Four HW (1, 2, 3 and 4 months after planting)	4.33	30.68	0.00	9.33	33.22	1.35	1.00	0.70	5.00	2.15	2.45	1.25
	(2.20)	(2.61)	(0.71)	(3.14)	(5.81)	(1.36)	(1.22)	(1.10)	(2.35)	(1.63)	(1.72)	(1.32)
Oxyflorfen 0.06 kg/ha PE	14.25	28.68	0.44	19.25	31.22	1.79	3.12	2.82	7.12	4.43	7.18	5.98
	(3.84)	(4.37)	(0.97)	(4.44)	(5.63)	(1.51)	(1.90)	(1.82)	(2.76)	(2.22)	(2.77)	(2.55)
Oxyflorfen 0.06 kg/ha PE + 1 HW (3 months after planting)	8.28	29.68	0.61	13.28	32.22	1.96	3.30	3.00	7.30	3.05	7.41	6.21
	(2.96)	(3.19)	(1.05)	(3.71)	(5.72)	(1.57)	(1.95)	(1.87)	(2.79)	(1.88)	(2.81)	(2.59)
Oxyflorfen 0.06 kg/ha PE + 2 HW (2 and 3 months after planting)	8.98	27.68	0.50	13.98	30.22	1.85	3.34	3.04	7.34	3.21	6.95	5.75
	(3.08)	(2.86)	(1.00)	(3.80)	(5.54)	(1.53)	(1.96)	(1.88)	(2.80)	(1.93)	(2.73)	(2.50)
Glyphosphate 2.0 kg/ha (POE 1 month after planting)	19.18	31.68	29.80	24.18	34.22	31.15	4.41	4.11	8.41	5.56	7.87	6.67
	(4.44)	(4.70)	(5.50)	(4.97)	(5.89)	(5.63)	(2.22)	(2.15)	(2.98)	(2.46)	(2.89)	(2.68)
One HW (1 month after planting) + glyphosphate 2.0 kg/ha (POE 2 months after planting)	16.88	25.68	4.80	21.88	28.22	6.15	3.88	3.58	7.88	5.03	6.49	5.29
	(4.17)	(4.02)	(2.30)	(4.73)	(5.36)	(2.58)	(2.09)	(2.02)	(2.89)	(2.35)	(2.64)	(2.41)
Two HW (1 & 2 months after planting) + glyphosphate 2.0 kg/ha (POE 3 months after planting)	7.23	33.68	5.17	12.23	36.22	6.52	1.97	1.67	5.97	2.81	3.78	2.58
	(2.78)	(3.11)	(2.38)	(3.57)	(6.06)	(2.65)	(1.57)	(1.47)	(2.54)	(1.82)	(2.07)	(1.75)
Black polythene mulch	6.30	32.68	3.20	11.30	35.22	4.55	1.50	1.20	5.50	2.60	3.12	1.92
	(2.61)	(5.76)	1.92	3.44	5.98	2.25	1.41	1.30	2.45	1.76	1.90	1.56
Weedy check	53.00	35.68	17.98	58.00	38.22	19.33	15.65	16.78	19.65	13.34	10.45	9.25
	(7.31)	(6.01)	(4.30)	(7.65)	(6.22)	(4.45)	(4.02)	(4.16)	(4.49)	(3.72)	(3.31)	(3.12)
LSD (P=0.05)	0.98	0.87	0.54	0.75	0.32	0.45	0.12	0.11	0.14	0.12	0.15	0.14

HW = Hand weeding, PE = Pre-emergence, POE = Post-emergence

Table 2. Influence of integrated weed management on weed control efficiency

Treatment	Weed control efficiency (%)					
	Grasses		Broad-leaved weeds		Sedges	
	2011	2012	2011	2012	2011	2012
Two hand weeding (1 and 2 months after planting)	52.2	55.7	38.2	40.9	32.4	37.6
Four hand weeding (1, 2, 3 and 4 months after planting)	69.5	73.6	47.8	56.2	48.1	57.6
Oxyflorfen 0.06 kg/ha PE	52.7	56.2	38.5	40.3	16.2	18.5
Oxyflorfen 0.06 kg/ha PE + 1 hand weeding (3 months after planting)	51.5	55.0	37.8	49.3	15.0	17.0
Oxyflorfen 0.06 kg/ha PE + 2 hand weeding (2 and 3 months after planting)	51.2	54.7	37.6	48.2	17.5	19.9
Glyphosphate 2.0 kg/ha (POE 1 month after planting)	44.9	48.3	33.5	33.8	12.6	14.2
One hand weeding (1 month after planting) + glyphosphate 2.0 kg/ha (POE, 2 months after planting)	47.9	51.4	35.5	36.8	20.1	22.9
Two hand weeding (1 and 2 months after planting) + glyphosphate 2.0 kg/ha (POE 3 months after planting)	60.9	64.6	43.3	51.1	37.5	43.8
Black polythene mulch	64.8	68.6	45.4	52.7	42.5	50.2
Weedy check	0.00	0.00	0.00	0.00	0.00	0.00

Table 3. Effect of integrated weed management practices on yield and economics

Treatment	Tuber yield (t/ha)		Weed index (%)		Cost: benefit ratio	
	2011	2012	2011	2012	2011	2012
Two hand weeding (1 and 2 months after planting)	14.77	13.47	38.1	36.9	0.66	0.36
Four hand weeding (1, 2, 3 and 4 months after planting)	23.85	22.55	0.00	0.00	1.10	1.20
Oxyflorfen 0.06 kg/ha PE	14.35	13.05	39.5	38.3	0.84	0.74
Oxyflorfen 0.06 kg/ha PE + 1 hand weeding (3 months after planting)	18.33	17.03	23.3	22.1	1.03	1.08
Oxyflorfen 0.06 kg/ha PE + 2 hand weeding (2 and 3 months after planting)	14.68	13.38	38.5	37.3	0.43	0.54
Glyphosphate 2.0 kg/ha (POE 1 month after planting)	15.46	14.16	35.0	33.8	0.93	0.89
One hand weeding (1 month after planting) + glyphosphate 2.0 kg/ha (POE, 2 months after planting)	17.67	16.37	25.9	24.7	0.91	0.89
Two hand weeding (1 and 2 months after planting) + glyphosphate 2.0 kg/ha (POE 3 months after planting)	21.12	19.82	11.5	10.3	1.02	1.13
Black polythene mulch	23.35	22.05	2.14	2.09	0.27	0.30
Weedy check	5.60	4.30	75.1	73.9	0.19	0.39
LSD (P=0.05)	2.19	2.73	-	-	-	-

PE = Pre-emergence, POE = Post-emergence

were reported by Pareek *et al*. (2000) and Mehriya *et al*. (2003). Weedy check recorded the highest density and dry weight of weeds owing to their greater competitive ability than cassava crop.

Crop

The tuber yield of 2011 was slightly higher than 2012 regardless to treatment imposed due to climate variation like early rain (20 mm) promoted little vegetative growth. But expression of growth parameters, weed indices and yield attributes under treatments were found similar in case of effectiveness. Single application of oxyflourfen 0.06 kg/ha as pre-emergence (14.33 and 13.05 t/ha) was significant over glyphosate 2.0 kg/ha alone (15.46 and 14.16). The maximum tuber yield (23.73 and 22.55 t/ha) was recorded under four hand weeding (at 1,2,3 and 4 month after sowing) followed by T_{10} (23.73 t/ha) and T_9 (22.77 t/ha). Minimum weed index (0.00) was recorded in treatment T_3 and maximum was in T_1 (78.13).

All weed management practices significantly improved the yield of tuber over weedy check. Four hand weeding at 30 days interval were effective for all flushes of weeds which provided suppression of weeds and congenial condition to tuber growth. The creation of weed suppressive environment for crop helped of check the growth of the weeds. Oxyflourfen

and glyphosate being broad spectrum herbicides supplemented by hand weeding improved yield potential with increasing the number of hand weeding over single application of herbicides. It might be attributed to the reduction in weed competitiveness with the crop. Similar findings were also reported by Mehriya *et al.* (2007) in cumin. Whereas in combination, the best combination was two hand weedings + glyphosate 2.0 kg/ha at 3 month after planting over other combination. Among hand weeding, four hand weeding gave the higher tuber yield (2.33 and 2.25 t/ha) over only two hand weeding (1.55 and 1.35 t/ha). Four hand weeding gave the higher benefit cost ratio (1:1.10 and 1:1.20) followed by two hand weeding (1 and 2 month after planting) + glyphosate 2.00 kg/ha as post-emergence at 3 month after planting (Table 3).

REFERENCES

Scott GH, Best R, Rosegrant MW and Bokanga M. 2000. Root and tubers in the global food system. A vision statement to the year 2020. *Inter CGIAR center Publication*, Lima, Peru, 111 p.

Cadavid LF, MA El-sharkewy, Acosta A and Sanchez T. 1998. Long term effects of mulch, fertilization and tillage on cassava grown in sandy soil in northern Columbia. *Field Crops Research* **57**: 45-56.

Ugwu BO. 1996. Increasing cassava production trend in Nigeria and prospects for sustaining the trend. *Outlook on Agriculture* **25** (3): 179-185.

Mehriya ML, Yadav RP, Jangir RP and Poonia BL. 2007. Nutrient utilization by cumin (*Cuminum cyminum*) and weeds as influenced by different weed control methods. *Indian Journal of Agronomy* **52**: 176-179.

Pareek NK, Jat NL and Pareek RG. 2000. Response of coriander (*Cuminum cymminum*) and weeds as influenced by different weed control methods. *Indian Journal of Agronomy* **16**: 104-109.

Panse VG and Sukhatme PV. 1967. *Statistical methods for agricultural workers*. ICAR publication, New Delhi. 62 p.

Singh G and Singh D. 1984. Herbicides cum cultural weed control in soybean. pp 35-36. In: *Proceeding of Annual Weed Science Conference*, Feb 27-28, JNKV, Jabalpur.

Singh F. 1987. Effect of pre-planting tillage and herbicides on weeds and fodder yield of M.P. *Indian Journal of Weed Science* **19**(3&4): 220-223.