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Short Communication

Effect of herbicides and mulches on production of onion (*Allium cepa* L.) in western Maharashtra

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Onion is an important horticulture commodity grown worldwide. It is one of the most important vegetable cash crops grown in India as well as in Maharashtra. It is used for both purpose as immature and mature bulbs as a vegetable and as a spice. It is also grown for their medicinal values. In India onion is grown under three crop seasons i.e. *kharif* (20%), late *kharif* (30%) and rabi-summer (50%) in a year. During 2014-15, total area under onion was 12.03 lakh hectares with a total production of 194.01 lakh tons. Maharashtra, Karnataka, Gujrat, Bihar, Madhya Pradesh, Rajasthan, Andra Pradesh and Tamil Nadu are the main onion growing states. The 30% area and 30% production alone come from Maharashtra. In Maharashtra it is grown on an area of 4.68 lakh hectares with 58.64 lakh metric tons production (Anonymous 2014). The productivity of onion was affected by biotic and abiotic stresses. The biotic stress i.e. weeds also causes heavy losses in yields of onion being a shallow rooted, sparse foliage and slow growing crop is prone to intensive weed competition both in nursery and transplanted crops particularly in *kharif* season. Weeds are also host to many pests particularly thrips the major insect causing direct damage by feeding on leaves and also acting as vector for various viruses responsible for yield reduction. Manual weeding is not only difficult in this closely spaced crop, but also labour intensive making their cultivation expensive (Kumar et al. 1992). Though some pre-emergence herbicides have been recommended, post-emergence herbicides are yet to be identified which could control both broad and narrow leaf weeds of wide spectrum as observed in this crop. Intensive and systematic research is required to overcome this challenge, which is responsible for substantial reduction in yield and quality of the produce. An attempt has been made with different herbicides and mulches to overcome the weed problems in onion.

An field experiment was conducted at All India Coordinated Research Project on Vegetable Crops, MPKV, Rahuri during *kharif* season of 2016 on medium black soils of western Maharashtra. The materials under investigation consist of herbicides and mulches along with weedy check in a randomized block design with four replications. The seedlings of a cv. Phule Samarth was prepared 60 days before transplanting and was done with a plot size of 3X2 meter and spacing of 15x10cm between rows and plants. The onion crop were transplanted on 30-08-2016 and harvested on 26-12-2016. The regular good agricultural practices were done to grow healthy crop. Six treatments under investigation consists were as T_1: oxyflurofen 23.5% EC application (1.5 to 2 ml/liter) before planting + one hand weeding at 60 days after transplanting; T_2 : oxyflurofen 23.5% EC application (1.5 to 2 ml/liter) before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application (2.5 to 3.5 ml/liter)at 60 days after transplanting ; T_3 pendimethalin 30 % EC application (3.5 to 4 ml/liter) before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application (2.5 to 3.5 ml/liter) at 60 days after transplanting, T_4 : plastic mulch: T_5: Organic mulch (biomass mulch) and T_6: weedy check (without weeding). The herbicide sprays was given as per treatment. The plastic mulch was laid out when the seedlings were established by using black-silver plastic strips of 10 cm width and 2m length, 30 mm thick in

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Table 1: Effect of weed management on yield and yield parameters for onion

Treatment	Total bulb yield (t/ha)	Bolters (%)	Doubles (%)	Marketable bulb yield (t/ha)	Plant height (cm)	Average weight of bulb (g)	Polar diameter (cm)	Equatorial diameter (cm)	Neck thickness (cm)
T_1	28.18	0.00	0.80	27.96	65.40	90.80	5.36	6.19	0.87
T_2	26.85	0.00	0.28	26.78	66.30	87.40	5.34	6.17	0.90
T_3	25.60	0.00	0.63	25.44	64.80	86.40	5.30	6.15	0.91
T_4	17.40	0.00	0.46	17.32	61.30	81.30	5.10	6.03	0.78
T_5	19.08	0.00	0.51	18.99	62.30	80.40	4.98	5.71	0.78
T_6	13.25	0.00	0.40	13.20	55.80	56.60	4.01	3.78	0.71
SEM±	1.29	--	0.09	1.20	1.01	1.30	0.70	0.60	0.03
CD (5 %)	3.94	--	0.29	3.91	2.80	3.40	2.10	1.80	0.06
CV %	12.06	--	38.34	12.03	3.40	5.31	3.40	3.10	2.30

T_1- oxyflurofen 23.5% EC application (1.5 to 2 ml/liter) before planting + one hand weeding at 60 days after transplanting ; T_2-oxyflurofen 23.5% EC application (1.5 to 2 ml/liter) before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application (2.5 to 3.5 ml/liter)at 60 days after transplanting; T_3- pendimethalin 30 % EC application (3.5 to 4 ml/liter) before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application (2.5 to 3.5 ml/liter) at 60 days after transplanting; T_4- plastic mulch; T_5- Organic mulch (biomass mulch); T_6- weedy check (without weeding)

each row of onion. The organic mulch of sugarcane straw @ 5 t/ha was placed in between rows of onion seedlings after establishment of seedlings i.e. after 10 days of transplanting. The observation on monocot and dicot weeds population was measured by placing 1 meter quadrant in beds and weeds was counted as monocot and dicot per meter square. The weed control efficiency was estimated as per treated and untreated plot i.e. weedy check. The yield per plot and ton/ha was measured. The % doubles bulb was subtracted from total yield to estimate marketable bulb yield in onion. The benefit cost ratio was estimated treatment wise considering the expenditure cost and income of that treatment. The data generated was statistically analyzed as suggested by Panse and Sukhatme (1985).

The herbicidal treatments and mulches have significant effect on yield and yield contributing characters of onion and were depicted in Table 1. The total bulb yield and marketable bulb yield was significantly influenced by different treatments. The maximum total yield was recorded by treatment T_1 ie. Oxyflurofen 23.5% EC application before planting + one hand weeding at 60 days after transplanting, 28.18 t/ha with 98.38% weed control efficiency followed by treatment T_2 ie. Oxyflurofen 23.5% EC application before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application at 60 days after transplanting, 26.85 t/ha with 100% weed control efficiency. The treatments T_3 also recorded 25.60 t/ha with 81.59 % weed control efficiency. The treatment T_4 ie plastic mulch recorded yield of 17.40 t/ha with 46.47 % weed control efficiency. The treatment T_5 ie organic mulch recorded the yield of 19.08 t/ha with 40.49 % weeds control efficiency. The treatments T_6 ie weedy check recorded the lowest yield of 13.25 t/ha. The maximum yield and weed control efficiency was recorded by oxyflurofen 23.5% EC (POE) + quizalafop ethyl 5% /EC (POE) was reported by Patle et al. (2016) in onion. Similar trend of results was also observed in present investigation Shinde et al. (2013) also reported the similar results as that of present investigation. Per cent doubled bulbs were recorded in all treatments and it was in the range of 0.28 to 0.80%. The bolting % was not observed in various treatments during *kharif* season. There % double bulbs was subtracted from total yield to obtain marketable bulb yield. The trend of marketable bulb yield was also as that of total yield in various treatments. Similar reports were also recorded by Patle et al. (2016) in onion crop.

The data on monocot and dicot weed population affected by different treatments was shown in Table 2. The highest monocot weed population per square meter was observed in weedy check (104.75) followed by T_4 (56.11), T_5 (53.40). T_3 (7.31) and T_1 (2.12) while weed population is lowest in treatment T2. The dicot weed population was maximum in T_6 (24.31) followed by T_5

Table 2: Effect of weed management on weed population and weed control efficiency in onion

Treatment	Monocot weed population/ m^2	Dicot weed population/ m	Total weed population/ m	Weed control efficiency (WCE) (%)
T_1	2.12	0.00	2.12	98.38
T_2	0.00	0.00	0.00	100.00
T_3	7.31	16.42	23.73	81.59
T_4	56.11	11.67	67.78	46.47
T_5	53.40	22.11	75.51	40.49
T_6	104.75	24.31	129.06	0.00
SEM±	0.50	0.16	0.66	5.33
CD (5 %)	1.52	0.49	2.01	15.40
CV %	4.70	3.68	8.38	11.53

Table 3: Cost of cultivation as influenced by weed management in onion

Treatment	Total bulb yield (t/ha)	Total income @ 700/q	Total cost of cultivation	B:C ratio
T_1	28.18	197365	147429	1.33
T_2	26.85	188034	148429	1.26
T_3	25.60	179256	149429	1.19
T_4	17.40	121793	151429	0.80
T_5	19.08	133637	145429	0.91
T_6	13.25	92834	143429	0.64

(22.11) T_3 (16.42) T_4 (11.67) while minimum in T_1 and T_2 (0.00) treatments. Similar results were also reported by Vashi et al. (2011). This clearly indicates that herbicide was more effective in controlling the weeds in onion. The treatment T_1 and T_2 has less weed count population as compare to other treatments. The mulches are also helpful in controlling weeds as compare to weedy check and helpful in conserving the moisture in soil. Similar results were also reported by Patle et al. (2016). Present result is also confirming close agreement as those reported by Patel et al. (1983) and Kumar et al. (1992). For controlling the weeds in *kharif* onion the treatment T_1 and T_2 i.e. oxyflyrofen 23.5% EC application before planting + one hand weeding at 60 days after transplanting and oxyflurofen 23.5% EC application before planting + one hand weeding at 30 days after transplanting + Quizalofop Ethyl 5% EC application at 60 days after transplanting recorded the maximum yield and weed controlling efficiency in onion cv. Phule Samarth. The plastic mulch and organic mulch also recorded better yields and weed control efficiency as compare to weedy check i.e. control. The herbicide use has more beneficial effects in controlling weeds and recorded maximum B:C ratio, the B:C ratio was also recorded treatment wise and it was maximum of treatment T_1 (1.33) followed by T_2 (1.26) and minimum in control i.e. T_6 weedy check (0.64) (Table 3). For controlling weeds in *kharif* onion Oxyflurofen and Quizalofop ethyl at required concentration was found beneficial as compare to mulches.

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