

Original Research Article

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Effect of Pre and Post Emergence Herbicides on Growth Parameters in Onion cv. N-53

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ABSTRACT

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A field experiment was conducted to find out best weed management practices in onion (*Allium cepa* L.) during rabi 2011-12 and 2012-13. The experiment was laid out in Randomized block design with three replications. The experiment consisted of pendimethalin, oxyflourfen as pre emergence herbicides and Imazethapyr and Quizalofop ethyl as post emergence herbicides and their combination thus forms 10 treatments along with Weedy check. Application of pendimethalin and oxyflourfen supplemented with Quizalofop ethyl @ 75 g a.i / ha as post emergence found to be on par with hand weeding thrice on increasing no. of leaves, LAI, plant dry matter and bulb yield. Imazethapyr @ 100 g a.i / ha as post emergence application (20 DAT) coupled with pre emergence herbicides produced the lower values than weedy check (T₁₀) as Imazethapyr found to be toxic to the Onion.

Introduction

Onion (*Allium cepa* L.) is an important bulbous vegetable crop grown in the world after tomatoes and is considered as top most export commodity among vegetables. Onion bulb is rich in minerals, especially calcium and phosphorus besides having fairly good quantities of carbohydrates, proteins and vitamin-C. It forms an indispensable part of many diets of both vegetarian and non-vegetarian as a flavouring agent. It is consumed in raw form and salads regularly in small quantities comparable with that of hot pepper. The outstanding characteristics of onion are the pungency, which is due to a volatile compound known as “Allyl-propyl

disulphide”, which is sulphur rich compound. It has got the effects of lowering the blood sugar fat and also having good coagulation effect. Because of its importance in cookery, onion is called “queen of the kitchen” by Germans (Vashi *et al.*, 2011).

At present, the production share of onion is 10.4 per cent of the total vegetable production with 11.4 per cent of total vegetable area in the country. In India, onion was grown on an area of 10.5 lakh hectares with a production of 168.1 lakh tonnes and the productivity is 16 tonnes per hectare. The major onion producing states are Maharashtra, Karnataka, Gujarat, Bihar, Madhya Pradesh, Andhra Pradesh, Rajasthan and Haryana. Andhra Pradesh

occupies 6th place in onion production. Andhra Pradesh covers an area of 0.8667 lakh hectares with a production of 15.60 lakh tonnes and the average productivity is 18tonnes per hectare. Onion accounts 9 percent of total vegetable production in A.P. (Indian Horticultural Database, 2013).

Among many causes of low productivity, onion exhibits greater susceptibility to weed competition as compared to other crops due to its inherent characteristics such as slow germination, extremely slow growth in the initial stages, short stature, non-branching habit, sparse foliage and shallow root system. This favours quick and fast growth of weeds in the initial stages and competition thus tends to be severe. Moreover, use of liberal dose of FYM, fertilizers and frequent irrigations creates favourable conditions for weed growth (Rajendra Singh *et al.*, 1986). It is an established fact that weeds compete with crop plants for space, nutrients, moisture and light there by reducing the quality and quantity of yield (Moolani and Sachan, 1966). If the weeds are present throughout the crop growth period, there may be complete loss of marketable yield. The reduction in bulb yield varies to the extent of 48 to 85 per cent depending upon the duration, intensity of weed growth and weed competition (Bhalla, 1978). Hand weeding in onion is a common practice in India, but it is a tedious expensive and time consuming task due to closer spacing and shallow root system. Non-availability of labourers during critical period of crop makes hand weeding difficult leading to heavy yield losses. The critical period of crop-weed competition in onion lies between 15-60 days after transplanting (Singh and Singh, 1994). Hence, managing the weeds meticulously in early stages is an imperative task to get higher weed control efficiency and bulb yield. Hence, this is imperative need to screen out suitable herbicides for weed control in combination with manual weeding in onion. Keeping the

above mentioned facts, the present investigation was under taken to find out efficacy and selectivity of various herbicides.

Materials and Methods

An experiment was conducted at Horticultural college and Research Institute, Dr. Y.S.R Horticultural University, Venkataramannagudem, Tadepalligudem, West Godavari District, A.P during Rabi season of 2011-12 and 2012-13. The soil was acidic in reaction and medium in NPK availability. The texture of the soil was sandy loam. The experiment was laid out in Randomised block design with three replications in a plot size of 4X3 m².

The seeds of onion cultivar “N-53” was sown for nursery raising and transplanting was done on ridge and furrow system by adopting spacing of 30X10 cm. The ten treatments consists of T₁- Pendimethalin @ 0.75 Kg a.i / ha as pre emergence application, T₂- Oxyfluorfen @ 0.125 Kg a.i / ha as pre emergence application, T₃- Imazethapyr @ 100 g a.i / ha as post emergence application (20 DAT), T₄- Quizalofop ethyl @ 75 g a.i / ha as post emergence application (20 DAT), T₅- Pendimethalin @ 0.75 Kg a.i / ha as pre emergence application + Imazethapyr @ 100 g a.i / ha as post emergence application (20 DAT), T₆- Pendimethalin @ 0.75 Kg a.i / ha as pre emergence application+ Imazethapyr @ 100 g a.i / ha as post emergence application (20 DAT), T₇- Oxyfluorfen @ 0.125 Kg a.i / ha as pre emergence application + Quizalofop ethyl @ 75 g a.i / ha as post emergence application (20 DAT), T₈- Oxyfluorfen @ 0.125 Kg a.i / ha as pre emergence application + Quizalofop ethyl @ 75 g a.i / ha as post emergence application (20 DAT), T₉- Weed free (Hand weeding) and T₁₀- Weedy check.

Forty five days old seedlings were used for transplanting. Upper one third portions of the

seedlings were removed at the time of transplanting to reduce the transpiration loss and better establishment of crop. All the package of practices to raise the good crop was done in the experimental field and weed control treatments applied as per the treatments.

Results and Discussion

Plant height (cm)

In both the years, weed management practices significantly influenced the plant height at various stages of growth. In all the treatments, plant height increased with increase in age of the crop up to 90 DAT, however the increase was rapid up to 60 DAT and thereafter the increase was at slower rate. In both the years, higher plant height was recorded with T10 (weedy check) in all the stages of crop growth which was on par with T9 (weed free-hand weeding at 20, 40, 60 DAT), T6 (Pendimethalin @ 0.75kg a.i/ha as PE coupled with Quizalofop ethyl @ 75g a.i/ha) and T8 (Oxyfluorfen @ 0.125 kg a.i/ha as PE coupled with Quizalofop ethyl @ 75 g a.i /ha.) Minimum plant height was recorded with T3 (Imazethapyr @ 60 g a.i / ha as POE) followed by T5 (Pendimethalin @ 0.75 kg a.i / ha as PE + Imazethapyr @ 60 g a.i / ha as POE) and T7 (Oxyfluorfen @ 0.125 kg a.i / ha as PE Imazethapyr @ 60 g a.i / ha as POE). The plant height was maximum in T10 (weedy control) because of the lanky growth due to poor exposure to direct sunlight. The results are in conformity with the findings of Channappagoudar and Biradar (2007).

Number of leaves per plant and Leaf area Index (LAI)

Weed management practices did not exhibit significant influence on no. of leaves per plant and Leaf area Index at 30 DAT during both the years of study. At 60 and 90 DAT,

maximum values of these attributes was recorded with T9 (weed free-hand weeding at 20, 40, 60 DAT), which was on par with T6 (Pendimethalin @ 0.75kg a.i/ha as PE coupled with Quizalofop ethyl @ 75g a.i/ha) and T8 (Oxyfluorfen @ 0.125 kg a.i coupled with Quizalofop ethyl @ 75 g a.i /ha.) respectively in both the years, while minimum values are recorded in T3 (Imazethapyr @ 60 g a.i / ha as POE) during both the years.

The maximum values of these attributes recorded in weed free (hand weeding at 20, 40 and 60 DAT) treatment might be due to least competition for nutrients, moisture, space and sunlight between crop and weeds, resulting in increased availability of assimilate for growth and development of the plant. Minimum values of these attributes in weedy check are due to suppression effects by weeds. These results were corroborating with those of Singh and Singh (1994) and Channappagoudar and Biradar (2007) (Table 1).

Total plant dry matter (g plant⁻¹)

The dry matter accumulation per plant at various stages of crop growth differed significantly between different treatments. Treatment T9 (weed free-hand weeding at 20, 40, 60 DAT) recorded significantly higher plant dry matter in various growth stages but remained comparable with T6 (Pendimethalin @ 0.75kg a.i/ha as PE coupled with Quizalofop ethyl @ 75g a.i/ha) and T8 (Oxyfluorfen @ 0.125 kg a.i coupled with Quizalofop ethyl @ 75 g a.i /ha.). At 30 DAT, the lowest plant dry weight was recorded in T10 (weed check). But at 60 and 90 DAT, the lowest values were recorded in T3 (Imazethapyr @ 60 g a.i / ha as POE) followed by T7 (Oxyfluorfen @ 0.125 kg a.i / ha as PE Imazethapyr @ 60 g a.i / ha as POE) and T5 (Pendimethalin @ 0.75 kg a.i / ha as PE + Imazethapyr @ 60 g a.i / ha as POE) in both the years (Table 2).

Table.1 Plant height (cm) and No. of leaves plant⁻¹ at various growth stages of Onion crop as influenced by weed management practices

	Treatment	Plant height (cm)						No. of leaves plant ⁻¹					
		30 DAT		60 DAT		90 DAT		30 DAT		60 DAT		90 DAT	
		2011-2012	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
T ₁	Pendimethalin @ 0.75 kg a.i / ha as PE	46.27	45.32	56.60	54.37	58.94	58.48	6.53	7.00	10.58	10.26	11.27	11.56
T ₂	Oxyfluorfen @ 0.125 kg a.i / ha as PE	44.01	43.53	55.27	53.82	57.68	57.26	6.48	6.73	10.18	10.06	11.07	11.47
T ₃	Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	38.52	39.77	28.90	33.43	31.56	34.20	6.35	6.33	5.26	5.33	7.50	8.67
T ₄	Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	46.13	46.17	53.80	51.58	56.38	56.57	6.47	7.27	9.85	9.73	10.67	11.37
T ₅	Pendimethalin @ 0.75 kg a.i / ha as PE +Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	44.93	43.23	33.90	35.38	35.40	34.97	6.40	6.60	6.53	6.77	9.13	9.60
T ₆	Pendimethalin @ 0.75 kg a.i / ha as PE + Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	48.60	51.07	61.65	62.03	63.58	64.40	7.33	7.53	11.76	11.82	12.73	13.21
T ₇	Oxyfluorfen @ 0.125 kg a.i / ha as PE Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	40.93	42.19	31.03	34.47	34.12	37.37	5.93	6.31	6.12	5.77	9.05	9.33
T ₈	Oxyfluorfen @ 0.125 kg a.i / ha as PE + Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	47.93	48.74	59.34	61.15	62.19	63.67	6.93	7.33	11.14	11.76	12.33	13.07
T ₉	Weed free (Hand weeding at 20, 40 and 60 DAT)	52.67	52.33	62.80	63.43	63.67	65.50	7.53	8.07	12.19	12.90	13.64	13.73
T ₁₀	Weedy Check	52.90	53.50	67.60	65.90	69.18	68.17	6.17	6.27	9.19	9.40	10.26	10.53
	S.Em±	2.16	2.10	2.78	3.56	2.58	2.59	0.46	0.37	0.44	0.43	0.73	0.72
	CD (P=0.05)	6.48	6.29	8.32	10.65	7.73	7.77	N.S.	N.S.	1.31	1.27	2.17	2.15

Table.2 Plant dry matter (g plant⁻¹), leaf area index and bulb yield (t ha⁻¹) at various growth stages of Onion crop as influenced by weed management practices

	Treatment	Plant dry matter (g plant ⁻¹)						Leaf area Index						Bulb yield (t ha ⁻¹)	
		30 DAT		60 DAT		90 DAT		30 DAT		60 DAT		90 DAT		201	201
		201 1- 12	201 2-13	201 1-12	201 2-13	201 1-12	201 2-13	201 1- 12	201 2- 13	201 1-12	201 2-13	201 1-12	201 2-13	1-12	2-13
T ₁	Pendimethalin @ 0.75 kg a.i / ha as PE	1.05	0.98	6.86	6.75	42.61	41.34	0.91	0.90	1.14	1.12	2.19	2.15	14.42	15.78
T ₂	Oxyfluorfen @ 0.125 kg a.i / ha as PE	0.97	0.86	6.22	5.61	39.78	37.94	0.87	0.89	1.07	1.09	2.12	2.01	13.64	14.92
T ₃	Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	0.73	0.69	2.17	2.05	12.55	10.63	0.78	0.75	0.62	0.53	1.26	1.08	0.54	0.63
T ₄	Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	0.87	0.83	5.75	4.88	34.37	31.43	0.83	0.86	0.98	0.89	1.94	1.92	11.50	12.63
T ₅	Pendimethalin @ 0.75 kg a.i / ha as PE +Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	0.75	0.74	2.29	2.42	14.25	13.55	0.85	0.81	0.75	0.61	1.35	1.25	0.70	0.77
T ₆	Pendimethalin @ 0.75 kg a.i / ha as PE + Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	1.45	1.35	7.94	7.41	47.23	44.40	0.95	0.98	1.36	1.31	2.48	2.38	17.75	18.29
T ₇	Oxyfluorfen @ 0.125 kg a.i / ha as PE+Imazethapyr @ 60 g a.i / ha as POE (20 DAT)	0.73	0.69	2.48	2.24	13.58	11.25	0.81	0.77	0.65	0.56	1.32	1.12	1.04	0.88
T ₈	Oxyfluorfen @ 0.125 kg a.i / ha as PE + Quizalofop ethyl @ 75 g a.i / ha as POE (20 DAT)	1.41	1.32	7.68	7.14	46.22	42.91	0.93	0.92	1.29	1.25	2.36	2.23	16.87	17.64
T ₉	Weed free (Hand weeding at 20, 40 and 60 DAT)	1.52	1.43	8.40	8.00	51.23	49.53	1.05	1.02	1.42	1.38	2.56	2.49	18.89	19.67
T ₁₀	Weedy Check	0.60	0.55	3.93	3.92	31.87	30.71	0.71	0.74	1.08	0.98	1.62	1.52	6.65	7.92
	S.Em±	0.04	0.38	0.39	0.33	2.38	2.24	0.09	0.09	0.09	0.08	0.12	0.09	1.00	1.06
	CD (P=0.05)	0.13	0.11	1.15	0.99	7.14	6.71	N.S.	N.S.	0.26	0.24	0.35	0.28	2.99	3.17

The results revealed that, the highest leaf dry matter was noticed with T₉ (weed free -hand weeding at 20, 40 and 60 DAT) treatment. This might be due to the better stature of the crop, which results in higher leaf dry matter accumulation due to lesser competition by weeds. Severe infestation of weeds in weedy check (T₁₀) might have resulted the lower dry matter accumulation.

These results corroborate the findings of Verma and Singh (1997), Porwal and Singh (1993) and Santosh *et al.*, (2004).

Bulb yield

The highest onion bulb yield were obtained under Hand weeding (T₉) treatment followed by application of pre emergence herbicides coupled with Quizalofop ethyl @ 75 g a.i / ha as post emergence application (20 DAT) during both the years respectively. These because of fact that the weed population and weed growth remain low from initial crop growth as compared to weedy check. The reduced crop-weed competition provide better environment for proper development of growth as well as yield attributes viz., Bulb

weight, Bulb diameter ultimately leading to the enhanced bulb yield. This might be due to proper weed management treatments controlled weeds effectively, reduced the competition from the weeds to a greater extent and thus helped in faster growth and development of onion bulb crop, resulting in obtaining higher values of yield attributing characters. The findings are closely vicinity of those reported by Warade *et al.*, (2006), Saraf (2007) and Shinde *et al.*, (2012) with respect to onion yield.

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