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Effect of weed management practices on nutrient uptake in weed and crop of onion (*Allium cepa* L.)

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Abstract
Five herbicides were analyses for controlling weeds in onion at the Horticultural Research and Instructional Farm, Indira Gandhi Agriculture University, Raipur (C.G.). The study report that efficacious weed control was under Oxyfluorfen 23.5% at 0.25 kg a.i./ha, Quizalofop-p-ethyl 5% EC at 75 g a.i./ha, Pendimethalin 30% EC at 1 kg a.i./ha, and manual weeding 40 days after transplanting with treatment T7 were considerably superior to other treatments. which was significantly reduced nutrient uptake by weed N (4.82 kg/ha), P (0.47 kg/ha), and K (0.44 kg/ha) and highest in control treatment T_{10} N (57.16 kg/ha), P (7.17 kg/ha), and K (6.85 kg/ha). Uptake of nutrients (kg ha^{-1}) by the plant was significantly more with treatment less weed infested T_7 treatment with N (75.98 kg ha^{-1}), P (25.68 kg ha^{-1}), K (95.90 kg ha^{-1}) and S (34.44 kg ha^{-1}). The lowest value of nutrient uptake was recorded in treatment T_{10} weedy check with N (11.01 kg ha^{-1}), P (3.84 kg ha^{-1}), K (13.25 kg ha^{-1}) and S (22.32 kg ha^{-1}) uptake by plant was significantly less due to high weed infestation in the plot.

Keywords: Weed management practices, nutrient uptake, weed, crop, *Allium cepa* L.

Introduction
India's most important bulbous vegetable crop is the onion, which is a member of the Alliaceae family of the genus Allium. The onion (*Allium cepa* L.), a biennial herb that is consumed year-round around the world and has been farmed since ancient times, is in higher demand both domestically and abroad due to its capacity to generate sizable foreign exchange. Among the many challenges faced by the community of farmers that raise onions, weeds offer a severe issue, reducing bulb production by 40–80%. As a result of onions' inherent characteristics, which include their short stature, non-branching habitat, sparse foliage, close transplant planting, shallow root systems, and extremely slow initial growth, frequent irrigation encourages weed growth, rendering traditional weed control methods unprofitable at uprooting weeds. (Ibrahim *et al.*, 2011) [5]. Weeds impede the effectiveness of fertilizer uptake by agricultural plants because they consume a significant amount of the fertilizer given to the soil. Because they reduce productivity, raise production costs, and degrade produce quality, weeds are considered a pest of crops. The crop cannot utilize the same amounts of growth factors as the weeds do. Higher productivity is said to be a result of managing weeds effectively. Onion weed competition causes yield losses of up to 40% to 80% (Channapagoudar and Biradar, 2007) [13]. Infesting fallow land, lowering soil fertility and moisture levels, and developing a possible threat to succeeding crops are among the difficulties that weeds bring to crop husbandry. In general, weeds compete with crop plants for nutrients and deplete the soil with 30-40% of applied nutrients. Weeds and crops compete fiercely for important nutrients like NPK. stated that weedy check had the highest removal of N, P, and K by weeds because weeds had higher dry matter, allowing them to absorb more nutrients. In addition to providing prompt and effective weed control, herbicides provide considerable opportunities to reduce weed management costs regardless of the situation.

Research Methods
A field experiment was conducted. Ten different treatments in a randomized block design with three replications. T_1- Oxyfluorfen 23.5% EC @ 0.25 kg a.i./ha + at 40 DAT, T_2- Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Fluazifop-p-butyl 11.1% SL @ 0.25 kg a. i./ha, T_3- Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Fluazifop-p-butyl 11.1% SL @ 0.25 kg a. i./ha + HW at 40 DAT, T_4- Oxydiargyl 80% WP @ 0.09 kg a.i./ha + Fluazifop-p-butyl 11.1% SL @ 0.25 kg a.i./ha, T_5- Oxydiargyl 80% WP @ 0.09 kg a.i./ha + Fluazifop-p-butyl 11.1% SL @ 0.25 kg a.i./ha+ HW at 40 DAT, T_6- Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Quizalofop-p-ethyl 5%

EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha, T_7- Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Quizalofop-p-ethyl 5% EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha + HW at 40 40 DAT, T_8- Oxydiargyl 80% WP @ 0.09 kg a.i./ha + Quizalofop-p-ethyl 5% EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha, T_9- Oxydiargyl 80% WP @ 0.09 kg a.i./ha + Quizalofop-p-ethyl 5% EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha + HW at 40 40 DAT, T_{10}- Control plot. In order to determine the uptake of nitrogen, phosphorus, potash, and sulphur by the plant as well as a weed from different weed management treatments, observations were made at the time of crop harvest by plant as well as weed nutrient analysis. The composite plant sample and weed sample at harvest from different treatments were estimated by modified micro-kjeldhal method, vanadomolybdate yellow color method, and flame photometer method. Uptake of NPK and S were calculated for leaves and bulb separately.

$$\text{Uptake (Kg/ha)} = \frac{\text{Nutrient content in leaves or bulb (\%)} \times \text{Yield (kg/ha) dry weight basis}}{100}$$

Result and Discussion

The present analysis are summarized below

Nutrients uptake by weed

Table 1 and Fig. 1 exhibit data on the nitrogen, phosphorus, and potassium intake (kg ha-1) by weeds as influenced by various treatments, and it is obvious that the weedy check treatment showed the highest uptake. The nutrient (NPK) depletion by weed was recorded highest in T_{10} N (57.16 kg/ha), P (7.17 kg/ha), and K (6.85 kg/ha). Whereas the lowest nutrient (NPK) depletion by weed was observed with treatment T_7 Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Quizalofop-p-ethyl 5% EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha + HW at 40 days after transplanting, N (4.82 kg/ha), P (0.47 kg/ha), and K (0.44 kg/ha).

Nutrients uptake by crop

The data presented in Table 2 and 3 and Fig. 2 & 3 showed that there was a uptake of nutrients (kg ha^{-1}) by plant was significantly more with treatment less weed infested T_7 Oxyfluorfen 23.5% @ 0.25 kg a.i./ha + Quizalofop-p-ethyl 5% EC @ 75 g a.i./ha + Pendimethalin 30% EC @ 1kg a.i./ha + HW at 40 days after transplanting, treatment with N (75.98 kg ha^{-1}), P (25.68 kg ha^{-1}), K (95.90 kg ha^{-1}) and S (34.44 kg ha^{-1}The NPK uptake by plants was highest in treatment less weedy plot (T7), according to the results. The higher nitrogen uptake treatment was observed due to less weed infestation, low weed competition, and higher production of dry matter and onion bulb yield as compared to other treatments. Sable *et al.* (2013) [14] reported similar outcomes as well. The lowest value of nutrient uptake was recorded in treatment T_{10} weedy check with N (11.01 kg ha^{-1}), P (3.84 kg ha^{-1}), K (13.25 kg ha^{-1}) and S (22.32 kg ha^{-1}) uptake by plant was significantly less due to high weed infestation in plot.

Table 1: Effect of different herbicides on NPK uptake in weed

Treatments	N uptake in weed (kg/ha)			P uptake in weed (kg/ha)			K uptake in weed (kg/ha)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T_1	16.28	15.98	16.13	1.70	1.71	1.70	1.80	1.69	1.75
T_2	18.51	19.29	18.90	1.92	2.05	1.99	2.26	2.00	2.13
T_3	15.41	14.52	14.97	1.62	1.58	1.60	1.56	1.62	1.59
T_4	17.05	17.37	17.21	1.75	1.84	1.80	1.93	1.92	1.92
T_5	11.51	11.74	11.63	1.22	1.26	1.24	1.19	1.32	1.25
T_6	6.77	6.82	6.80	0.73	0.75	0.74	0.48	0.76	0.62
T_7	4.82	4.82	4.82	0.46	0.48	0.47	0.35	0.54	0.44
T_8	9.47	9.66	9.57	0.99	1.04	1.02	0.95	0.99	0.97
T_9	8.78	9.03	8.90	0.92	0.95	0.94	0.70	0.97	0.84
T_{10}	57.70	56.61	57.16	5.81	8.52	7.17	7.30	6.41	6.85
SEm (±)	3.27	3.55	3.41	0.33	0.60	0.48	0.41	0.43	0.42
CD (5%)	9.73	10.55	10.55	0.98	1.78	1.78	1.22	1.29	1.29

Table 2: Effect of different herbicides on NPK and S uptake by leaves.

Treatments	N uptake by leaves (kg/ha)			P uptake by leaves (kg/ha)			K uptake by leaves (kg/ha)			S uptake by leaves (kg/ha)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T_1	7.95	6.76	7.37	3.64	3.09	3.38	13.34	11.34	12.37	6.07	6.28	6.19
T_2	4.35	5.00	4.69	2.00	2.30	2.16	8.50	9.43	8.99	6.66	5.84	6.27
T_3	9.64	8.19	8.94	4.39	3.73	4.07	15.58	13.24	14.45	7.77	7.05	7.43
T_4	6.01	5.11	5.57	2.86	2.43	2.65	11.09	9.78	10.46	6.98	6.26	6.64
T_5	11.46	9.74	10.63	5.08	4.32	4.71	18.42	15.66	17.08	8.48	7.54	8.03
T_6	16.78	15.64	16.26	7.44	6.99	7.23	26.21	24.91	25.63	9.47	9.08	9.30
T_7	18.40	19.30	19.01	8.22	8.56	8.46	29.31	30.14	29.95	9.96	9.55	9.83
T_8	13.09	12.79	12.98	5.89	5.70	5.81	20.73	20.03	20.43	8.64	8.17	8.43
T_9	15.05	15.05	15.09	6.71	6.77	6.76	23.57	23.84	23.77	9.22	8.73	9.00
T_{10}	2.83	2.41	2.64	1.23	1.05	1.15	5.07	4.31	4.73	5.27	5.37	5.37
SEm (±)	1.15	1.38	1.27	0.56	0.61	0.58	1.92	1.80	1.86	0.83	0.72	0.78
CD (5%)	3.43	4.10	4.10	1.67	1.80	1.80	5.72	5.33	5.33	2.48	2.13	2.13

Table 3: Effect of different herbicides on NPK and S uptake by onion bulb.

Treatments	N uptake by bulb (kg/ha)			P uptake by bulb (kg/ha)			K uptake by bulb (kg/ha)			S uptake by bulb (kg/ha)		
	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled	2020-21	2021-22	Pooled
T_1	24.67	20.72	22.76	7.68	6.45	7.09	26.41	22.18	24.38	18.01	19.64	18.91
T_2	13.49	15.65	14.61	4.63	5.36	5.01	13.72	15.92	14.86	17.47	20.38	19.00
T_3	29.93	25.14	27.62	9.44	7.93	8.71	33.07	27.78	30.52	19.86	21.60	20.81
T_4	19.47	16.35	17.97	6.38	5.37	5.90	19.55	16.42	18.04	18.52	20.63	19.65
T_5	35.90	30.16	33.13	10.97	9.21	10.13	39.41	33.10	36.37	20.86	22.24	21.64
T_6	50.36	47.18	48.92	15.00	14.86	14.98	58.30	54.36	56.51	22.33	24.49	23.51
T_7	56.17	58.08	57.64	16.45	18.12	17.47	63.59	68.77	66.81	24.01	25.37	24.99
T_8	40.41	38.76	39.70	12.52	11.52	12.06	44.94	43.36	44.29	21.55	22.90	22.32
T_9	46.14	46.88	46.65	13.71	14.05	13.93	51.62	52.13	52.04	21.70	23.63	22.76
T_{10}	9.12	7.66	8.47	2.94	2.47	2.73	9.31	7.82	8.65	16.76	17.23	17.20
SEm (±)	3.51	3.29	3.40	1.02	1.22	1.13	4.15	3.87	4.01	1.95	2.44	2.21
CD (5%)	10.42	9.76	9.76	3.03	3.63	3.63	12.34	11.50	11.50	NS	NS	NS

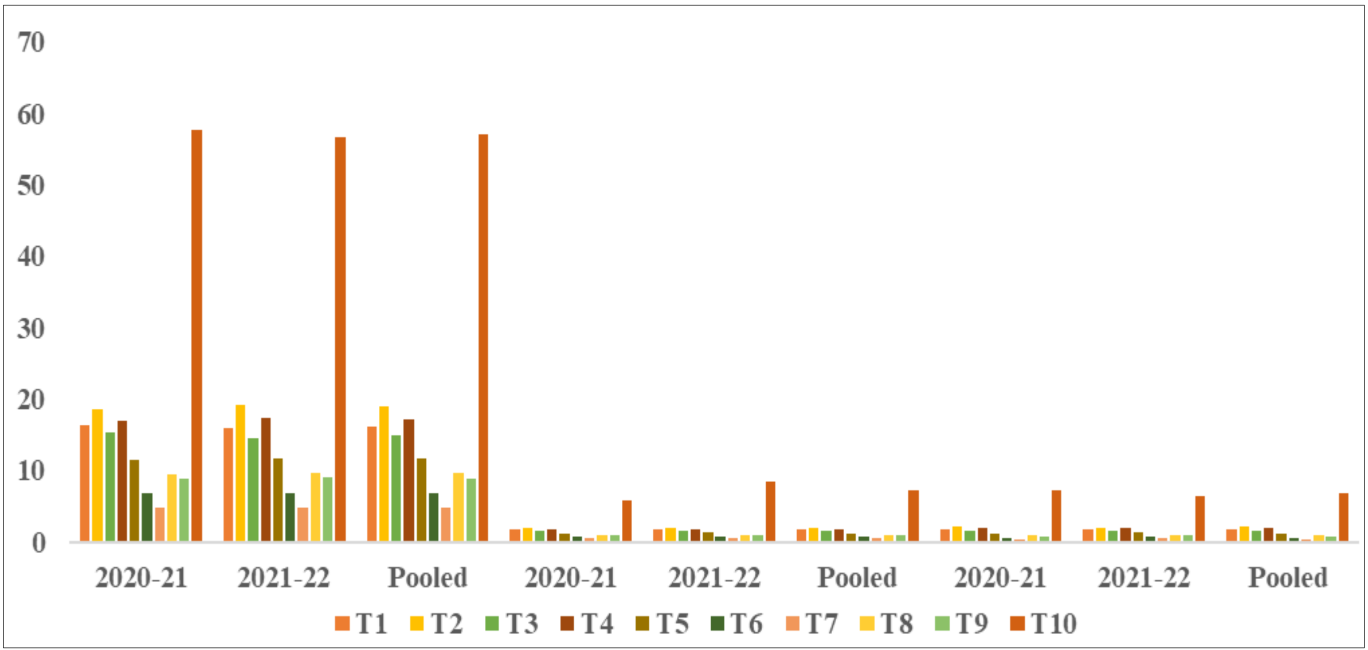

Fig 1: Impact of different herbicides on N, P and K uptake in weed

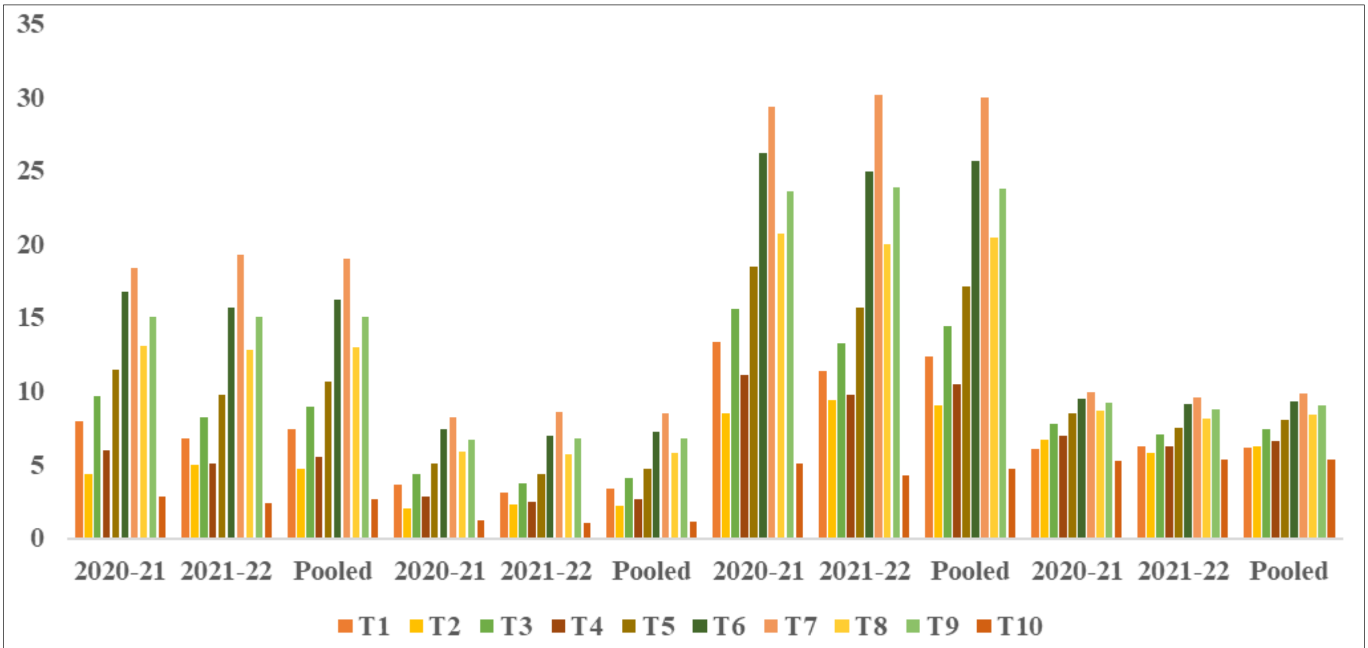

Fig 2: Impact of different herbicides on N, P, K and S uptake by leaves

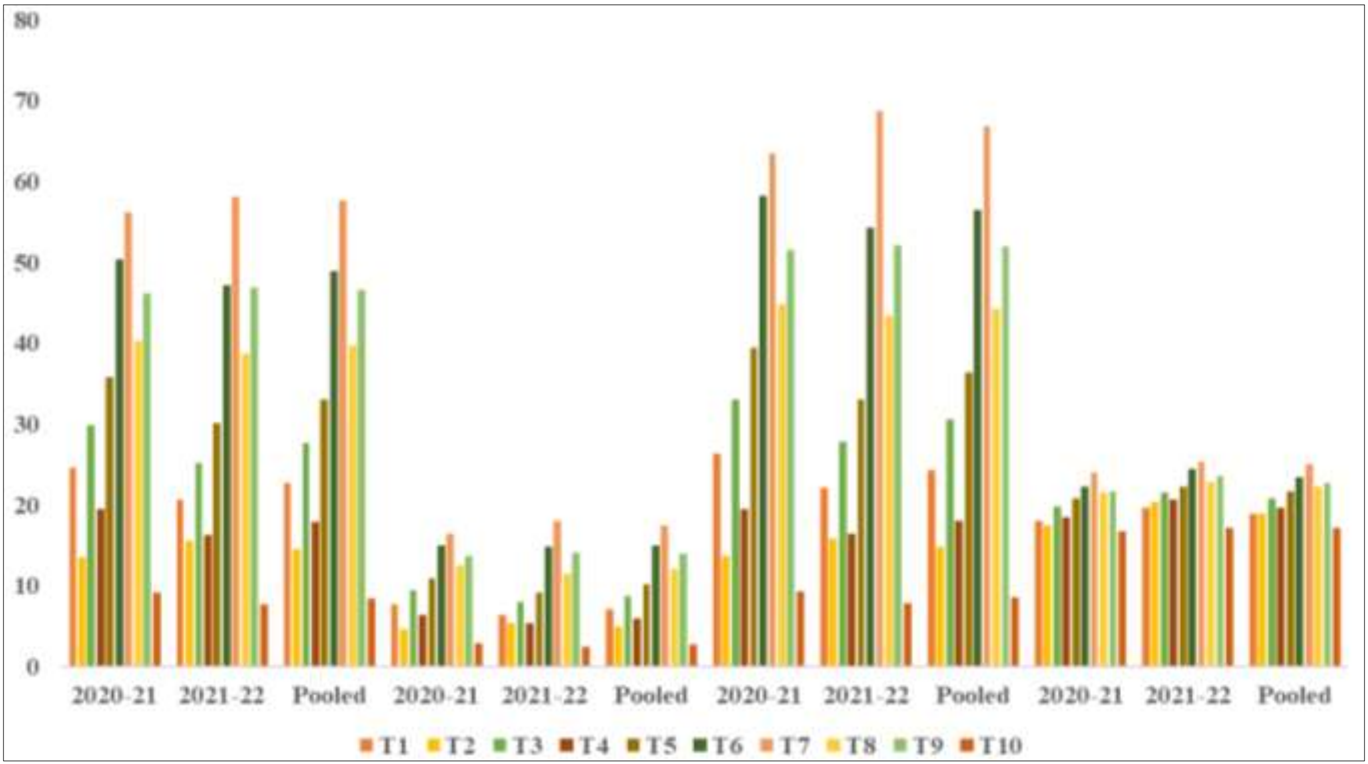

Fig 3: Impact of different herbicides on N, P, K and S uptake by onion bulb.

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