

Effect of Organic and Inorganic Herbicidal Treatments on the Growth and Yield of Potato (*Solanum Tuberosum L.*)

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Abstract

Field research was conducted to observe the effect of organic and inorganic herbicidal treatments on the growth and yield of potato crop. Sorghum extract spray, Stomp spray and manual weeding treatments were tested singly and in various combinations. Data related to various parameters revealed that Sorghum extract sprayed treatments (T₁, T₂, T₃ & T₄) superceded control (T₀), manual weeding (T₅) & Stomp spray (T₆). Overall, maximum germination (83.88%), minimum mortality (16.12%), maximum plant height (33.75 cm) & maximum number of leaves (50.50) were observed in case of one Sorghum extract spray (T₁) whereas, weight of tubers per plant (537.1 g), weight of tubers per plot (17.25 kg) & yield per hectare (31.02 tons) were reported to be best in case of three Sorghum extract sprays (T₃). On the other hand manual weeding (T₅) & Stomp spray (T₆) showed poor results for various parameters studied.

Key words: Potato, Herbicide, Growth and yield

Introduction

Like other crops, production of potato (*Solanum tuberosum L.*) in Pakistan is too low as compared to the developed countries of the world. The main reasons for this low production could be attributed to the non-availability of certified and disease free seed of high yielding varieties, improper plant protection measures and above all lack of proper weed control methods which become, the principal source of yield reduction. The potato crop gets highly infested with a number of weeds and it becomes imperative to get rid of them because they complete with plant for every thing it requires like light, nutrients, water, etc. Different methods used for the control of weeds in plant are mechanical, biological, manual and chemical methods. Chemical method is the most effective method of the day. It involves the use of many organic and inorganic weedicide for the control of weeds.

Unlike manual and mechanical methods, chemical methods are less dependent on weather and hence more practicable for use during the critical periods of weed-crop competition. At the same time chemical method may cause a great damage to the crop if improper application is done in the form of improper weedicide, method of application and dose etc. At the same time cost of production is also increased. On the other hand some important organic (natural) compounds exist which can be used as herbicide about which growers have no information.

Therefore, it is very important to find out any suitable technology for the control of weeds of the crops which should be pollution free, cheap, easy to use and easily available everywhere. Present studies were an effort to find out appropriate technology for the control of weeds of potato crop in the light of above facts.

Materials and Methods

The present studies were carried out at the Vegetable Research Area, Department of Horticulture, University of Agriculture, Faisalabad during 1999 -2000. Plant material for the studies consisted of the potato variety PARS -70. Nitrogen, Phosphorus and Potassium were applied in the form of Urea, DAP and Potassium Sulphate; @ 80Kg/acre N, 34Kg/acre P and 48Kg/acre K.

Potato crop was sown on 7th October, 1999. Seed was planted on ridges which were kept 70cm apart and plant to plant distance was 20cm. seed tubers were kept on ground at proper distance and covered by erecting appropriate ridges that covered tubers against sunshine. Before sowing, land was well prepared by 4 -5 ploughings and well rotten FYM was applied where as Chemical fertilizers were applied at the time of sowing. The experiment was laid-out according to Randomized Complete Block Design alongwith four replications and nine treatments. In each treatment five plants were randomly selected and tagged for data collection. Treatments used are summarized below:-

- T0: Control
- T1: Sorghum extract; one spray after 10 days of sowing.
- T2: Sorghum extract; two sprays after 10 and 20 days of sowing.

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Table 1: Effect Of Organic And Inorganic Hrbicidal Treatments On The Growth And Yield Of Potato Crop

Treatments	Germination (%) After one Week	Germination (%) After two Week	Germination (%) After three Week	Germination (%) After four Week	Total Germination (%)	Mortality (%)	Plant height (cm)	Number of stems per plant.	Number of leaves per plant	Weed population	Fresh weight of weed population (g)	Weight of single tuber (gm)	Number of tubers per plant.	Weight of tubers per plant (gm)	Weight of tuber per plot (kg)	Tuber yield per (t/ha).
T ₀	12.50bc	21.88c	45.63ab	80.00abc	80.00abc	20.00abc	30.25	2.75	41.75d	2.50	3.86a	58.58a	8.50ab	498.0ab	15.90a	28.59a
T ₁	10.00c	27.50abc	46.88a	83.88a	83.88a	16.12c	33.75	3.00	50.50a	2.75	3.89a	59.90a	8.25ab	494.8ab	16.36a	29.42a
T ₂	11.63bc	28.38ab	41.88abc	83.13a	83.13a	16.87c	31.50	2.25	42.75d	2.50	1.44b	59.00a	8.25ab	467.2ab	15.50a b	27.87ab
T ₃	13.13bc	25.00abc	42.50abc	80.63abc	80.63abc	19.37bc	30.00	2.25	43.25c d	2.50	2.21b	59.45a	9.00a	537.1a	17.25a	31.02a
T ₄	15.00b	24.38abc	42.50abc	81.63ab	81.63ab	18.37bc	33.50	3.25	47.25a bc	2.00	5.10a	61.10a	7.00bc	429.6abc	14.19a b	25.52ab
T ₅	12.50bc	23.75abc	43.13abc	75.63c	75.63c	24.37a	32.00	3.00	44.75b cd	2.25	5.70a	43.85a	7.25bc	316.2c	9.51c	17.11c
T ₆	13.75b	30.00a	33.75d	77.50bc	77.50bc	22.50ab	30.50	2.75	33.25c	2.25	5.09a	47.08c	6.50c	302.1c	9.31c	16.74c
T ₇	13.75b	22.50bc	38.90bcd	75.63c	75.63c	24.37a	31.25	2.25	45.50b cd	2.75	2.06b	45.47c	7.00bc	315.0c	9.55c	17.17c
T ₈	18.38a	22.50bc	36.88cd	77.50bc	77.50bc	22.50ab	31.25	3.75	48.75a b	2.75	1.76b	51.28 b	7.50ab c	384.9bc	11.87b c	21.35bc

Means sharing similar letters are non-significant at 5% level of significance.

Herbicidal Treatments on the Growth and Yield of Potato (*Solanum Tuberosum L.*)

- T3: Sorghum extract; three sprays after 10,20 and 30 days of sowing.
T4: Sorghum extract; four sprays after 10,20,30 and 40 days of sowing.
T5: Hand weeding after 20 and 40 days of sowing.
T6: Spraying of stomp after 5 days of sowing.
T7: Spraying of stomp after 5 days of sowing + one hand weeding.
T8: Spray of stomp after 5 days of sowing + Sorghum extract after 10 days of sowing.

Following data were recorded using standard procedure:-

1. Germination percentage (Weekly)
2. Total germination percentage
3. Mortality percentage.
4. Plant height (cm)
5. Number of stems per plant.
6. Number of leaves per plant.
7. Observations on weed growth and population.
8. Observations on insect attack and disease incidence.
9. Weight of single tuber (g)
10. Number of tubers per plant.
11. Weight of tubers per plant (g).
12. Weight of tubers per plot (kg).
13. Yield per hectare (t/ha).

The data collected were analyzed using analysis of variance technique and differences among various treatment means were determined by using New Duncan's Multiple Range Test (Petersen, 1994) at 5% level of significance.

Results and Discussion

Data regarding weekly and total germination % revealed significant results. Results obtained are astonishing because planting material (potato tuber) being homogenous cannot be the source of variability. Therefore it can be concluded that the behaviour of different organic and inorganic herbicides on identical lines have their own significance. At first interval T8 and T4 showed best germination percentage. At second interval T6 and T2, at third interval T1 and T0, at fourth interval T1 and T2 showed the maximum germination percentage. Maximum total germination percentage was recorded in case of T1 and T2. These results are in agreement with Khan (1976) who recorded similar observations on potato germination. Significant difference were observed in case of mortality percentage of different treatments, herbicides are the chemicals which require application at proper stage and in proper distinct dosage. Significant difference in mortality might be attributed to the tonic effect of herbicide application due to improper stage of application or improper dosage. Change in herbicide concentration alongwith time of applications may

possibly reduce mortality percentage. The maximum mortality was recorded in T5 and T7 whereas, minimum mortality % was noted in case of T2. These results are also supported by Sahfi (1959).

Plant height and number of stems per plant showed non-significant results. Initially potato tuber planted as seed supports nutrients for the plant growth and number of eyes on the tuber determines the number of stems per plant if other conditions are uniform. After the initial growth plant depends on the soil nutrients. In case of good weed control, plant becomes free of competition and grows better. The maximum plant height was observed in T1 and T3. It may also be concluded that T1 and T4 gave good control of weeds to free plant from competition with weeds for vegetative growth. Number of stems produced were maximum in case of T8 & T4. Similar findings were also reported by Saleem (1964), Khan (1976) and Sarwar (1972).

In case of number of leaves per plant significant differences were observed. It is evident from Table, that T1 showed the highest and T6 the lowest number of leaves. The number of leaves depend upon the number of branches per plant and plant height which in turn depend upon the weed control. The better control of weed determines better growth and development of the plant so it can be evaluated that T6 gave the best results in this case and these results are in league with the findings of Shafi (1959), Saleem (1964), Hussain (1975) and Safdar (1975).

Weed population was minimum in case of T4 followed by T5 and T6 whereas, T1, T7 and T8 remained at top for this factor of study. As for as concerned fresh weight of weeds, T5 secured first position whereas, T2 showed minimum fresh weight remaining at par with T8.

Significant differences were observed among different treatments as concerned weight of single tuber, number of tubers per plant, weight of tubers per plant, weight of tuber per plot and tuber yield per hectare. Single tuber weight measured was maximum in case of T4, followed by T1, T2 and T3 whereas, T5 remained at bottom. The maximum number of tubers per plant and total yield per hector were recorded in T3 where-as, T6 remained at the bottom. These results are in agreement with the findings of Rioux (1976), Morrow and Muphy (1986), Renner, Powel and Pieree (1988), Tripathi, Singh and Bhargava (1990) Nenakhoava (1991), Phogat, Bhan, Singh and Dhawan (1991).

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