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EFFECT OF SOWING TECHNIQUES ON WEEDS GROWTH AND YIELD OF TURNIP CULTIVARS

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ABSTRACT

A research work titled "Effect of sowing techniques on weeds growth and yield of turnip cultivars" was carried out at Ornamental nursery, Department of Horticulture, The University of Agriculture, Peshawar. The experiment was carried out in a Randomized Complete Block Design with split plot arrangement. Sowing techniques (ridges and flat beds) were allotted to main plots, while cultivars (purple top, white globe and pahuja) were assigned to sub plots. Results showed that all the parameters except weed density and weed biomass were significantly affected by cultivars. Pahuja cultivar was best for number of leaves plant^{-1} (17.19), root diameter (6.18 cm), root weight (142.61 g) and total yield (14.09 tons ha^{-1}), while white globe cultivar showed lowest results in number of leaves plant^{-1} (14.70), root diameter (4.56 cm), root weight (56.07 g) and total yield (5.59 tons ha^{-1}). Sowing on ridges and flat beds had also significantly affected all the parameters. Maximum number of leaves plant^{-1} (18.59), root weight (146.87 g), root diameter (6.20 cm) and maximum yield (14.68 tons ha^{-1}) was on ridges, while minimum root weight (71.09 g), root diameter (4.54 cm) and lowest yield (6.98 tons ha^{-1}) in flat beds. Minimum weed density (102.90 m^{-2}) and weed biomass (1340 kg ha^{-1}) was noted in ridges sown crop while maximum weed density (11.78 m^{-2}) and weed biomass (1402 kg ha^{-1}) was noted in flat sown crop. Among various treatments used, ridges sowing and pahuja cultivar is recommended for maximum yield of turnip.

Key words: Sowing techniques, turnip cultivars, weeds, yield.

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INTRODUCTION

Brassica rapa L. (turnip) belongs to Brassicaceae (Cruciferae) family, also called mustard family. *Brassica rapa* was the name given to turnip by the Romans and has persisted until now (*rapa* = root forming). The word crucifer refers to flower's shape, with four transversely reverse, cross formed petals. Turnip is the most important dicotyledonous, cross pollinated and cool season root vegetable crops. *Brassica rapa* has green leaves and the leaves at upper portion moderately holding the stalk. Well branched stem depends on the scale of branching affected by diversity and ecological conditions. At axils the twigs of the upper most foliage initiate on the stalk, and each ends at inflorescence. The flowers are pale yellow, compactly clustered at the top (Downey *et al.*, 1980). *Brassica rapa* can be divided into: (1) Indian forms; (2) western European and north American form; (Kimber and McGregor, 1995). Still the domestication place and time is unknown, but according to Indian Sanskrit turnip is directly related to the mustard crop and also oilseed rape similar as written in Chinese, Roman and Greek literature of 500 to 200 BC (Downey and Robbelen, 1989).

It is an important vegetable usually grown in moderate climatic conditions for production of its tender storage root. Primary roots of turnip develop into storage organ which is used as vegetables in tender form while secondary roots emerge from hypocotyls. The yield and quality of this root crop is determined by initiation, growth stage and time of harvest (Reid and English, 2000). Turnips are among one of cool season crop, which can bear the heat and it is also resistant to frost. Adverse temperature between -6 and -10 ºC endure turnip leaves, while bulbs can bear temperature between -9 to -13 ºC (Penrose *et al*., 1996). Air temperature can also effect turnip yield and quality but air temperature near or above 32 ºC its growth, development and yield can remain un affected (2.2 and 6.3 t ha^{-1} of DM for roots and tops respectively) even when the air temperature exceed 32ºC (Jung and Shaffer, 1993). Turnips can be grown on all soil types. Moderately deep, friable fertile, well drained soil is ideal for quick seed germination and the plants make rapid growth and increase in size. Extremely tight clay soil tends to restrict root development and cause forked root. The finest roots produced in sandy soil. In deep loam soil, it can produce high yield (Srinivasa, 1998). Weed control has prime importance because it is among one of serious perils which accounts much for crop loss by affecting the growth and development process directly or indirectly. Weeds limit the nutrients, water, light and other essential requirements through competition with the main crop and as a result the yield and quality is decreased (Bukun, 2004; Iftikhar *et al.,* 2010).

A ridge is a raised, long, narrow and elevated land with sloping sides. On ridges soil will be lose and more nutrients will be available to plants which resulted in increased yield. Under varying climatic condition, planting method and crop sown, the growth pattern of weeds can also be changed. Ridge formation results in accumulation of upper soil portion which affect the uniform density of weed, while in flat beds, weeds are usually evenly distributed throughout the field.

MATERIALS AND METHODS

An experiment was carried out at the Ornamental Nursery of the University of Agriculture Peshawar during 2012. The turnip seeds were obtained from local market of Peshawar. Before seeds sowing, the field preparation was properly carried out with fine plough, and well-rotted FYM manure was properly supplemented to the soil. Then plots were made. After crop sowing, field was properly irrigated. Sowing was done on 4th November. Seeds were sown on ridges and in flat beds. Six beds each measuring 1m in length and 0.9m width raised beds. Weeding and irrigation was done whenever required. The experimental design was Randomized Complete Block Design (RCBD) with split plot arrangement. Factors included sowing techniques and cultivars. Each treatment was replicated thrice. Thus there were 18 sub-plots in entire experiment with three ridges and three lines in flat beds. The plant to plant distance was kept 10 cm and row to row distance 30 cm.

Crop growth parameters

The data for statistical analysis was collected on the different variables which were weed density (m^{-2}), weed biomass (kg ha^{-1}), number of leaves $plant^{-1}$, root diameter (cm), root weight (g) and total yield (tons ha^{-1}).

Statistical analysis

Data noted on different crop growth parameters were subjected to ANOVA procedure to confirm variations between different treatments and their replications. Least significant difference test was applied to the significantly variant results for mean differences. Computerized statistical analysis software ‘’MSTATC” was used for calculating the ANOVA and LSD.

RESULTS AND DISCUSSION

Weed density m^{-2}

The statistical analysis revealed that weed density was significantly affected by sowing techniques. The results were non-significant for the cultivars and interactions between Cultivars and sowing techniques. It is clarified from the means that maximum weed density (118.78 m^{-2}) was observed in flat plots, while lowest (102.90

m^{-2}) was noted in crop sown on ridges. During ridges preparation, with the soil accumulation on ridges might have exposed certain weed seeds which may fail to germinate because of exposing to harsh and anti germination environmental conditions that ultimately reduced the weed population due to less germination compared to flat sowing. These results are similar to that of Nadeem *et al*. (2013) who recorded maximum weed density in crop sown in flat as compared to crop in ridges. Similarly Aslam *et al.* (2007) and Parminder et al. (2007) reported lower density and dry matter of weeds in raised bed planting.

Weed biomass (kg ha^{-1})

The data pertaining to weed biomass is presented in Table-1. The statistical analysis revealed that sowing techniques has significant effect on weed biomass, while cultivars and their interaction have non-significant effect. Mean table showed maximum weed biomass (1402.5 kg ha^{-1}) in plants sown in flat beds, while minimum (1340.0 kg ha^{-1}) was recorded in plants which were sown in ridges beds. Similarly to weed density, the decrease in weed biomass in crop sown in ridges might be due to the exposure of weed seeds above soil surface to weather extremities. Nadeem *et al.* (2013) reported similar results.

Number of leaves $plant^{-1}$

The data associating to the number of leaves $plant^{-1}$ is arranged in Table-1. It is clear from the data that both sowing techniques and cultivars significantly affected number of leaves $plant^{-1}$. Comparing the means of different treatments, highest number of leaves $plant^{-1}$ (17.26) was recorded in purple top cultivar, while minimum (15.03) was noted in white globe cultivar. The means of sowing techniques revealed that highest number of leaves $plant^{-1}$ (18.59) was noted in plants which were sown on ridges and less number of leaves $plant^{-1}$ (14.18) was recorded in plants sown in flat beds. The interaction effect was non- significant. The increase in number of leaves might be due to the difference in genetic makeup of cultivars. Also due to less number of weeds and vigorous growth of plants in ridges might be the possible reasons in maximum number of leaves. Brijbhoosham *et al*. (2015) reported maximum number of leaves in raised bed sowing as compared to flat beds.

Root diameter (cm)

The statistical analysis revealed that sowing techniques and cultivars have significantly affected root diameter, but their interaction had proved non-significant results (Table-2). The means of different cultivars showed that maximum root diameter (6.18 cm) was noted in pahuja cultivar, while the minimum (4.55 cm) was found in white globe cultivar. It might be due to the genetic makeup of cultivars, which resulted in increased yield. Regarding sowing techniques maximum root diameter (6.20 cm) was attained in plants sown on

ridges, where as minimum root diameter (4.54 cm) was recorded in plants sown in flat beds. The interaction between cultivars and sowing techniques was non-significant. Same results were recorded by Ponjican *et al*. (2012), who stated that the root length and diameter was more on ridge, as compared to flat bed.

Root weight (g)

The statistical analysis of variance indicated that sowing techniques and cultivars have significantly affected root weight per plant (Table-2). Maximum root weight (142.61 g) was recorded for plants of pahuja cultivar, while minimum (56.06g) was observed for plants of white globe. For sowing techniques the highest root weight (146.87g) was recorded for plants, which were sown on ridges, while the lowest root weight (71.09 g) was observed for plants, which were sown in flat beds. Interaction between sowing methods and cultivars was also significant. Looking at the means highest weight (200.24 g) was recorded in plants (pahuja cultivar), which were sown on ridges, while the plants of white globe gave the lowest root weight (51.78 g) in flat beds. (Ponjican *et al.,* 2009) observed that the average root weight of carrot was more in mini beds as compared to flat beds.

Total yield (tons ha^{-1})

Statistical analysis showed that yield ha^{-1} was significantly affected by sowing techniques, cultivars as well as by their interaction (Table-2) Looking at the means of cultivars highest yield (14.09 tons ha^{-1}) was obtained in pahuja cultivar and lowest yield (5.59tons ha^{-1}) was obtained in white globe cultivar. Mean table showed that highest yield (14.68 tons ha^{-1}) was observed in plants grown on ridges and lowest yield (6.98 tons ha^{-1}) in flat beds. The increase in yield in ridges sown crop might be due to less number of weeds and vigorous growth. The findings are in agreement with Zalatarius (1998) for carrot, who stated that sowing on ridges gave more yield of carrot root, as compared to sowing in flat beds. Same results have been recorded by Ponjican (2012), who noted the carrot sowing on ridges gave more uniform growth, which influence the market quality as compared to sowing in flat beds. The interaction effect was also significant. Maximum yield (20.01 tons ha^{-1}) was noticed in pahuja cultivar, which were sown on ridges, while minimum yield (5.51 tons ha^{-1}) in white globe cultivar sown in flat beds.

CONCLUSION

It is concluded from the research that sowing in ridges is effective in reduction of weeds density, weed biomass, escalating the growth and yield components such as number of leaves, root diameter, root weight and yield ha^{-1}, as compared to sowing in flat

beds. Pahuja cultivar performed better than other cultivars in most of growth component studied during the course of research work.

Table-1. Effect of sowing techniques on weed density m^{-2}, weed biomass (kg ha^{-1}) and number of leaves $Plant^{-1}$ of Turnip cultivars.

Treatments	Weed density (m^{-2})	Weed biomass (kg ha^{-1})	No of leaves $Plant^{-1}$
Cv1=Purple top	121.15	1426.43	17.26 a
Cv2= Pahuja	119.07	1443.46	17.19 a
Cv3= White globe	124.34	1460.12	14.70 b
L.S.D (0.05)	NS	NS	*
Sowing techniques			
S1=Flat	118.78 a	1402.5 a	15.03 b
S2= Ridges	102.90 b	1340.0 b	18.59 a
Significance level	*	*	*
Interactions			
Cv×S	NS	NS	NS

Means in the same column with different letters are significantly different at α=0.05 using LSD test; * = Significant, ns = Non-Significant

Table-2. Effect of sowing techniques on Root diameter (cm), Root weight (g) and Total yield t ha^{-1} of Turnip cultivars.

Cultivars	Root diameter (cm)	Root weight (g)	Total yield t ha^{-1}
Cv1=Purple top	5.39 ab	128.27 a	12.82 a
Cv2= Pahuja	6.18 a	142.61 a	14.09 a
Cv3= White globe	4.56 b	56.07 b	5.59 b
L.S D (0.05)	*	*	*
Sowing techniques			
S1=Flat	4.54 b	71.09 b	6.98 b
S2= Ridges	6.20 a	146.87 a	14.68 a
Significance level	*	*	*
interactions		76.51 bc	7.65 bc
Cv×S	Ns	*	*

Means in the same column with different letters are significantly different at α=0.05 using LSD test; * = Significant, ns = Non-Significant

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