Genetic Variability, Correlation and Path Study in Radish (Raphanus Sativus L.) under near Temperate Conditions of Garhwal Hills

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Abstract— Twenty one genotypes of radish were evaluated in Rabi seasons of 2014-15 for different horticultural traits. The phenotypic and genotypic coefficients of variation were found moderate for root weight without leafs, leaf weight, root weight with leafs, root diameter and root length. High heritability coupled with moderate genetic gain observed for root length, root weight with leafs, root weight without leafs, leaf weight and root diameter. The phenotypic and genotypic correlation coefficients among different characters showed that marketable root yield per hectare had positive and significant association with root weight without leaf, root weight with leaf, root length, number of leaves and length of whole plant. The path coefficient analysis revealed that maximum positive direct effect towards root yield per plant was contributed by root weight without leaf, length of whole plant, root weight with leaf, number of leaves, thereby indicating the importance of these traits for yield improvement in radish through direct or indirect selection.

Key words: Radish, Genetic Evaluation, Heritability, Correlation, Path Analysis

I. INTRODUCTION

Radish (Raphanus sativus L.) is one of the most popular vegetable of the family Cruciferae, with a chromosome number 2n=2x=18. It is an ancient crop, native to the Eastern Mediterranean and the Middle East. Radish is a popular root vegetable which is grown from temperate to tropical regions of the world. Roots and leaves are rich source of vitamin A, vitamin C, mineral and carbohydrates. The role of genetic variability in a crop is of paramount importance in selecting the best genotypes for making rapid improvements in yield and related characters as well as to select most potential parents for conducting successful hybridization programmes. The success of breeding programme depends on the availability of genetic variability present in the existing germplasm. Since, most of the plant characters of economic importance are polygenic in nature and are highly influenced by environment, it is necessary to work out whether the observed variability is heritable or due to environment. It appeared imperative to work out the phenotypic variation into heritable and non-heritable components along with analysis for correlation and path coefficients to get the better estimates of genetic components of the variability its associations among various traits.

II. MATERIAL AND METHOD

The investigation was carried out at the Vegetable Demonstration and Research Block, Department of Vegetable Science, College of Horticulture, Bharsar, VCSG Uttarakhand University of Horticulture and Forestry Bharsar. Seeds were sown directly in the field during the month of September 2, 2015 at a spacing of 45cm × 10cm in a plot of 1.35 m^2 size. There were three rows of ten plants in each plot. Thirty plants of each genotype were planted in each replication under Completely Randomized Block Design (CRBD) with three replications. The standard cultural practices, were followed to ensure a healthy crop stand. Observations were recorded on quantitative traits viz, days to 50% germination, root weight with leaves, root weight without leaves, leaf weight, number of leaves, length of whole plant, root length, leaf length and root diameter on five randomly selected plants in each plot along with data for root yield per plot was also recorded.

III. RESULT AND DISCUSSION

A. Genetic variability

In Rabi season, significant variations were observed among all the genotypes for days to 50% germination minimum (7.0 days) were recorded in Japanese White. Highest root weight with leaves and without leaves was recorded in Rajasthan Local viz, 409.28g and 273.97g, respectively. Similar findings were also reported earlier by Kumar et al (2012) Ullah et al. (2010), and Mallikarjunarao et al (2015), Thorat et al (2013), and Sivathanu et al (2014). Maximum Leaf weight was recorded in Bharsar Local (174.45 g). Similar level of variations was also observed earlier by Amin and Singla (2010) and Ullah et al (2010). Maximum number of leaves was recorded in Bharamasi Long (15.87). Ullah et al (2010), and Mallikarjunarao et al (2015) have also reported similar variations for this trait. Significantly, higher length of whole plant was recorded in Lambi Vilayati (70.31cm). The trend of variations was earlier reported by Mapari et al (2009), Amin and Singla (2010), Sharma et al. (2002) and Ullah et al. (2010) in radish. Highest root length was recorded in Japanese white (35.63cm). The results of present studies for root length are in line with Sharma et al (2002), Mapari et al (2009), Amin and Singla (2010). Maximum leaf length was recorded in Dunagree (44.46cm), also reported earlier by Naseeruddin et al (2014), Sivathanu et al (2014) and Mallikarjunarao et al (2015). Highest root diameter was recorded in Dunagree (5.67cm), Mapari et al. (2009) also observed the same. Maximum root yield per plot (Kg) was recorded in the genotype Rajasthan Local (8.22 Kg). Tremendous variations regarding yield parameter in radish have also been reported earlier by Ijoyah et al (2008), Mapari et al (2009), Amin and Singla (2010), Ullah et al (2010), Sivathanu et al (2014) and Mallikarjunarao et al (2015).

B. Coefficients of variation

In Rabi season, the phenotypic coefficients of variation (PCV) and genotypic coefficients of variation (GCV) were recorded moderate for root weight without leaves, leaf

weight, root weight with leaves, shelf life without leaves, root diameter, dry matter, shelf life with leaves and root length. Earlier worker, Sivathanu et al (2014) had also reported similar phenotypic and genotypic coefficients of variation trends for different traits under study. High heritability coupled with moderate genetic gain were observed for root length, root weight with leaves, root weight without leaves, leaf weight, root diameter and dry matter. Similar results, for different traits under study, were also reported by Ullah et al (2010) and Kumar et al (2012).

C. Correlation Studies

In Rabi season, plot yield had positive and significant association with root weight without leaves, root weight with leaves, root length, number of leaves and length of whole plant, while significant and negative correlations were observed with leaf length and root diameter. Similar correlations of yield with various horticultural traits have also been reported earlier by several workers viz, Mukhdoomi et al (2008), Ullah et al (2010) and Jatoi et al (2011).

D. Path Coefficient Analysis

Maximum positive direct effect of root weight without leaves, length of whole plant, root weight with leaves and number of leaves was seen over the yield. While root length, leaf length, root diameter, leaf weight, days to 50 percent germination and dry matter content were observed to have negative direct effect over yield per plot. At genotypic level residual effect was found to be 0.00298. Mukhdoomi et al. (2008), Sivathanu et al. (2014) and Rajput and Pal (2014), had reported similar direct and indirect effects of various horticultural traits on yield in radish.

IV. CONCLUSION

From the present investigation, it can be concluded that six genotypes viz, Rajasthan Local, Radish Long Marwari, 40 Days, Japanese White, Bharamasi Long and Arka Nishant recorded higher root yield and also performed better for horticultural traits than the check cultivar. These genotypes need further testing to be released as a substitute of already existing radish varieties prevalent in the mid hills of Garhwal or they can also be involved in breeding programme for development of superior varieties for yield improvement in radish. High heritability coupled with moderate genetic gain was found for root length, root weight with leaves, root weight without leaves, leaf weight, root diameter and dry matter. Hence, selection can be proved effective for improvement in yield and its attributing traits. In other words, these traits can be improved by artificial selection. The correlation studies revealed that root yield per hectare had positive and significant association with root weight without leaves, root weight with leaves, root length, number of leaves, length of whole plant and leaf weight, that indicate the importance of consideration of these traits for improvement to ultimately achieve higher yield. The path coefficient analysis revealed maximum positive direct effect towards root weight without leaves, root weight with leaves, root length, leaf length, dry matter contents, days to 50 percent germination and root diameter, whereas, maximum positive indirect effects of root weight with leaves, root length, number of leaves, length of whole plant and leaf weight via root weight without leaves. Thereby, indicating the importance of these traits for yield improvement in radish through direct or indirect selection.

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