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Studies on character association and path coefficient analysis for grain yield and its influencing traits in little millet (*Panicum sumatrense*)

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Abstract
The present investigation entitled "Studies on character association and Path coefficient analysis for grain yield and its influencing traits in little millet (*Panicum sumatrense*)" was conducted to estimate genetic variability, character association, path analysis and genetic divergence. Present investigation was carried out at All India Coordinated Research Project on Small Millet, at the college of agriculture farm Rewa (MP) during *kharif* 2014. Higher magnitude of PCV and GCV was recorded for days to 50% flowering whereas moderate value of GCV and PCV showed by the characters days to maturity, plant height, tillers/ plant, flag leaf length, peduncle length and 1000 grain weight. High estimates of heritability was recorded for days to 50% flowering, days to maturity, plant height, tillers/ plant, flag leaf length, flag leaf width, peduncle length, length of inflorescence, biological yield/ plant, grain yield /plant and 1000 grain weight. High estimates of genetic advance was recorded for the characters viz., days to 50% flowering followed by flag leaf width, days to maturity, peduncle length, plant height, tillers/ plant and flag leaf length. Grain yield/plant showed highly significant and positive phenotypic correlation with harvest index, length of inflorescence, biological yield/plant and peduncle length. Path coefficient analysis indicated that the maximum positive direct effect on grain yield/plant followed by biological yield/plant, days to 50% flowering, length of inflorescence, peduncle length, tillers/plant and 1000 grain weight.

Keywords: Phenotypic, genotypic, correlation, grain yield, path coefficient

Introduction
Little millet (*Penicum sumatrence*) belong to family Poaceae (*gramineae*), having diploid chromosome number 2n = 36, it is locally known as Kutki, Samai (Hemalatha *et al*. 2014) [9]. It is an important reliable climate resistance small seeded crop grown by tribal and poor farmers in adverse agro-climatic conditions for their own consumption. In India, crop is cultivated in more than half a million hectares predominantly in the state of Madhya Pradesh, Tamilnadu, Orissa Jharkhand Chhattisgarh and Gujarat. The state of Madhya Pradesh ranks first for Kodo and kutki growing states in the country. The advantage of millets lies in the fact that they can be grown in infertile soil, intense heat, and scanty rainfall (Gupta *et al*. 2014) [7]. For millions of people in the semi-arid tropics of Asia and Africa, millet has been the most important staple food for centuries. They are sometimes known as the "poor man's cereal" because given choice, people go for other cereals such as wheat or rice. Lipids are relatively minor constituents in cereal grains, however, they contribute significantly to diet as a source of invisible fat and essential fatty acid (Achaya 1986; Achaya 1987) [1, 2]. The lipid also have an important role in storage quality and processing of cereal, among minor millets account for about 1% of good grains produced in the world and they are useful as food crops in their respective agro-eco systems (De Wet, 1989) [3], rural people used millets as an important staple food and also an alternative for alcoholic beverages.

Materil and Method
The experimentation was carried out to "Studies on character association and Path coefficient analysis for grain yield and its influencing traits in little millet (*Panicum sumatrense*)" at All India Coordinated Research Project on Small Millet, at the college of agriculture farm Rewa (MP) during *kharif* 2014. The experimental materials of the present study comprised 20 genotypes of Little Millet (*Panicum sumatrense*) viz., DhLtMV 36-3, TNPSU 174, BL 8, Kadiri 1, DLM 89, TNPSU 167, BL 150, OLM 203, DLM 103, TNPSU 171, JK 8, TNPSU 170, BL 6, DhLtMV 10-2, TNAU 160, BL 41-3, KOPLM 53, GPUL 1, GPUL 2 and LOCAL. The parents were selected on the basis of different genetic and geographical origin.

The 20 genotypes were tested in randomized block design with three replications. Phenotypic, genotypic and environmental correlation among grain yield and its influencing characters were calculated according to procedure given by Miller *et al*., (1958) [12]. The path coefficient is estimated by solving following sets of simultaneous equations indicating the basis relationship between correlation and path coefficient. The estimates of direct and indirect effects of quantitative traits on seed yield where calculated through path coefficient analysis suggested by Wright (1921) [18] and elaborated by Dewey and Lu. (1959) [4].

Result and Discussion:

The prime objective of most of the plant breeding programme is to make an improvement in yield; Yield is a complex, polygenic trait that is strongly influenced by environmental factors Arnold *et al*., (2004).The changes of yield in relation to components traits are studied in the context of the concepts of yield correlation and path analysis. The knowledge of association between the characters and their direct and indirect contribution towards expression of grain yield will be of an additional help to plant breeders in deciding the selection criteria. A perusal of the data in Table (1) Grain yield/plant showed highly significant and positive phenotypic correlation with harvest index, length of inflorescence, biological yield/plant and peduncle length. None of the trait had found significant and negative correlation coefficient with grain yield/plant at phenotypic level. Among the pairs of contributing characters the correlation coefficient revealed that the estimates of genotypic correlation were higher in magnitude than the corresponding phenotypic correlation for all the traits. Similar studies on correlation coefficient in minor millets were also done which supported that the present experimental outcome by the following authors Kumar (2009) [10], Ganapathy *et al*., (2011) [6], Haradari *et al*., (2012) [8], Dikshit and Nizar (2013) [5], and Manjunath *et al*., (2013) [11]. Correlation coefficient values do not reveal the real association pattern of the independent variables with the dependent one. Path coefficient analysis on the other hand is an efficient statistical technique specially designed to qualitative interrelationship of different components and their direct and indirect effect on grain yield. This approach is more important to comprehend genetic makeup of a dependent trait when the determining component characters are correlated, the results by the path coefficient analysis presented in Table (2) The path-coefficient analysis was carried out by using phenotypic as well as genotypic correlation coefficients between 12 characters to resolve direct and indirect effects of different characters on grain yield per plant. Effect of contributing traits over grain yield were in accordance with previous findings of the following authors Salini *et al*., (2010) [14], Shet *et al*., (2010) [16], Shinde *et al*., (2010) [17], Sasamala *et al*., (2011) [15] and Ramesh and Pal (2011) [13].

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