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# PATH COEFFICIENT ANALYSIS IN ELITE MUTANT LINES IN SIX CULTIVARS OF KHESARI (*LATHYRUS SATIVUS* L.)

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## Abstract

The relationship between seed yield and seven agronomic traits was studied through path analysis in 81 elite mutant lines of khesari (*Lathyrus sativus* L.). There was strong positive direct effect of seeds per plant on seed yield at both phenotypic and genotypic level. 100 seed weight and seeds per pod were the other traits which directly affected yield in positive direction while number of primary branches at genotypic level only had negative direct effect but this negative effect has been nullified by positive indirect effect via seeds per plant. In addition to direct effect, indirect effect via other traits have also influenced yield considerably.

***Key words:*** *Lathyrus sativus*, critical path analysis, agronomic characters, seed yield, Genotypic and phenotypic correlations.

## Introduction

Yield is governed by many physiological process with in the plant and influenced by many environmental factors. Therefore, direct selection for yield as such will not be very reliable. For improving the yield levels, an understanding of direct and indirect effects of component characters on yield is of prime importance. Parihar *et.al.* (2015) reported that coefficient of genotypic and phenotypic variations suggest that there is a good scope for seed yield improvement through pod per plant, seed yield per plant, biological yield and harvest index. Characters which had low genetic advance indicates that they are governed by non-additive gene action. Path coefficient and correlation revealed that biological yield and harvest index were the most important yield component that could be used as selection for improvement in grasspea. Therefore, in the present study relationship between seed yield and other agronomic traits was studied through correlation and path analysis in the induced mutants of khesari (*Lathyrus sativus* L.).

## Materials and Methods

Eighty one elite mutants were selected among numerous mutants induced by separate and simultaneous application of gamma rays, ethyl methane sulphonate (EMS), diethyl sulphate (DES) and N-Nitroso-N-Methyl Urea (NMU) from cv. NIRMAL, LSD-3, DL-250, PLK-750, Roma-2 and P-24. M3 populations of the selected mutants were planted in a randomized row design with five replications. Observations were recorded for eight characters *viz.* days to first flower, plant height, number of primary branches, pods per plant, seeds per pod , seeds per plant, 100-seed weight and yield per plant. Path coefficient analysis with seed yield as the dependent variable was carried out according to Dewey and Lu (1959) at phenotypic as well as genotypic level.

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## Results and Discussion

Total correlation coefficients with seed yield as well as the result of partitioning these correlations into direct effects and indirect contributions through other variables has been presented in table-1.

A comparison of path values with the total correlations at phenotypic and genotypic levels shows that the more subtle indirect effects were also important and have often served to mask the direct effect. At phenotypic level seeds per plant had the maximum positive direct effect on yield. It was followed by 100-seed weight, pods per plant, seeds per pod, plant height, days to first flower and number of primary branches in that sequence. At the genotypic level seeds per plant had maximum positive direct effect followed in sequence by 100-seed weight, pods per plant, seeds per pod, days to first flower

**Table 1:** Direct and indirect effects of different characters (path coefficient) on yield per plant at phenotypic (P) and genotypic (G) levels in induced mutants of khesari.

| Characters | Level | Days to first flower | Plant height (cm) | Number of primary branches | Pods /'plant | Seeds /pod | Seeds /plant | 100-seed weight (gm) | Correlation with seed yield |
|---|---|---|---|---|---|---|---|---|---|
| Days to first flower | P | (0.021) | 0.000 | 0.000 | -0.075 | -0.003 | -0.152 | -0.024 | -0.233* |
| | G | (0.046) | 0.000 | -0.001 | -0.065 | 0.004 | -0.249 | -0.014 | -0.280* |
| Plant height(cm) | P | 0.000 | (0.028) | 0.004 | 0.106 | -0.006 | 0.226 | 0.142 | 0.502* |
| | G | 0.002 | (0.005) | -0.031 | 0.065 | -0.009 | 0.268 | 0.267 | 0.567* |
| Number of primary branches | P | -0.001 | 0.016 | (0.007) | 0.105 | -0.001 | 0.238 | 0.092 | 0.456* |
| | G | 0.001 | 0.004 | (-0.040) | 0.079 | -0.003 | 0.352 | 0.198 | 0.591* |
| Pods/plant | P | -0.006 | 0.011 | 0.003 | (0.277) | 0.002 | 0.591 | 0.013 | 0.890* |
| | G | -0.018 | 0.002 | -0.019 | (0.166) | 0.011 | 0.736 | 0.005 | 0.883* |
| Seeds/pod | P | -0.001 | -0.002 | 0.000 | 0.007 | (0.082) | 0.180 | -0.086 | 0.180* |
| | G | 0.002 | -0.001 | 0.001 | 0.024 | (0.077) | 0.348 | -0.157 | 0.296* |
| Seeds/plant | P | -0.005 | 0.010 | 0.003 | 0.259 | 0.023 | (0.631) | -0.007 | 0.914* |
| | G | -0.015 | 0.002 | -0.018 | 0.156 | 0.034 | (0.783) | -0.031 | 0.011* |
| 100 seed weight (gm) | P | -0.002 | 0.014 | 0.002 | 0.012 | -0.024 | -0.015 | (0.298) | 0.285* |
| | G | -0.002 | 0.003 | -0.019 | 0.002 | -0.029 | -0.059 | (0.414) | 0.309* |

Residual factor =0.064 and 0.024 at phenotypic and genotypic levels respectively. *= Figure in parenthesis refer to direct effects.

and plant height while number of primary branches had negative direct effect. Direct effect of seed yield on seeds per plant and 100-seed weight was the main source of strong positive correlation at both the level.

Indirect effect via seeds per plant were the most conspicuous among all the traits at both phenotypic and genotypic levels and mainly responsible for strong positive correlation in case of plant height, number of primary branches, pods per plant and seeds per pod and strong negative correlation for days to first flower. In some cases positive or negative direct effects have been nullified by stronger indirect effects in opposite direction, so that the direction of the ultimate association is different from the direction of direct effect.

In an earlier study on mutated populations in khesari, Kumar and Dubey (1997) pointed out that internode length at phenotypic level and number of primary branches at genotypic level were the most important yield components with maximum positive direct effect while negative direct effect of 100-seed weight on seed yield at genotypic level was most conspicuous. According to Kumari and Prasad (2005) large differences in pods per plant, seeds per pod, days to podding, days to flowering, number of branches and plant height would help to obtain model plant architecture while according to Das and Kundagarmi (2002) and Kour and Agrawal (2016), the traits showing strong and positive correlation with seed yield may be given priority while characters showing negative correlation should avoid during selection of superior genotypes for improving seed yield in grasspea.

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