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Correlation and Path Coefficient Analysis in Ashwagandha (*Withania somnifera* Dunal)

V.S. Kubsad*, Y.B. Palled, C.P. Mansur and S.C. Alagundagi
Department of Agronomy,
University of Agricultural Sciences, Dharwad-580 005, Karnataka

An experiment on correlation and path coefficient analysis in ashwagandha was conducted at Agricultural Research Station, Annigeri (Karnataka) during early *Rabi* season of 2004 and 2005 under rainfed conditions. The results on correlation coefficients indicated that the harvest index exhibited the highly significant and positive correlation with dry root yield per plant followed by plant height and dry matter per plant. While the highest direct and positive effect on dry root yield per plant was observed with harvest index followed by dry matter per plant, LAI and plant height. The root length showed the highest negative direct effect on dry root yield per plant.

Key words: Ashwagandha, correlation, path analysis, yield contributing characters

Ashwagandha (*Withania somnifera* Dunal), one of the important medicinal plants is being used in traditional Indian medicines against many human diseases since ancient times. The roots are the commercial parts of the plant having medicinal properties (Gupta *et al*., 1996). It occupies an area of 10,780 ha with a production of 8429 tones in India (Tripathi *et al*., 1976). The full production potentiality of the crop can be exploited only under good management practices. An attempt was made to study correlation and path coefficient analysis of various growth and yield parameters in ashwagandha under varied sowing dates and harvesting stages.

Materials and Methods

A field experiment was conducted during early *Rabi* season of 2004-05 and 2005-06 at Agricultural Research Station, Annigeri (Karnataka) under rainfed conditions. The soil of the experimental site was vertisols with pH of 8.1, low in available N (231.6 kg/ha), medium in available P_2O_5 (22.7 kg/ha) and high in K_2O (468.1 kg/ha). The experiment was laid out in RBD (Factorial) design with three replications. There were twelve treatment combinations comprised of four sowing dates (15th August, 30th August, 15th September and 30th September) and three harvesting stages (120 DAS, 150 DAS and 180 DAS). The FYM @ 2 t/ha was applied and mixed well in soil at 15 days prior to sowing. The seeds of ashwagandha cv. Jawahar Asgandh-20 were treated with Bavistin @ 2g/kg seeds against damping off-disease. The crop was sown on different dates as per the treatments at 15 cm x 10 cm spacing and a fertilizer doze of 12-24 kg N and P/ha was applied at sowing during both the years. The crop was thinned at 30 DAS to retain one seedling per hill. The total rains received during cropping period were 352.8 mm and 515.4 mm during 2004 and 2005 respectively. The crop was sprayed with Monocrotophos @ 1 ml/l against aphids and was harvested as per the different harvesting stages during both the years. At harvest, five plants were randomly selected in each treatments for recording the data on growth and yield parameters. Data were analysed for correlation (Falconer, 1964) and path analysis (Dewey and Lu, 1959).

*Corresponding author

Results and Discussion

The correlation between dry root yield per plant with different yield attributes and amongst the attributes themselves are presented in the Table 1. The correlation analysis revealed that dry root yield per plant was highly significant and positively correlated with harvest index and plant height. Further, dry matter per plant exhibited significant and positive correlation with dry root yield per plant and thus indicated that these parameters have certain inherent relationship with yield. The results of the present investigation are in agreement the findings of Konimozhi (2003) in medicinal coleus.

Harvest index and root diameter had highly significant positive correlation with plant height which revealed that tall plants could contribute to dry matter production coupled with root yield. Dry matter production per plant showed highly significant positive correlation with root length which confirmed that dry matter production is responsible for increasing the root length. Dry matter production per plant also had highly significant positive association with LAI and LAD. Harvest index indicates more of dry matter accumulation in roots resulting in higher root length and root diameter. Similar results were reported by Hegde (1992) for root yield of medicinal coleus.

Table 1. Correlation coefficients for yield and yield components in ashwagandha [Mean of two years]

Characters	Plant height(cm)	Branches/ plant	DM(g/ plant)	LAI	LAD (days)	NAR(g/ dm²/day)	HI(%)	Root length (cm)	Root diameter (cm)	Dry root yield(g/ plant)
Plant height	1.000	0.596*	0.525	-0.523	-0.468	-0.518	0.862**	0.526	0.815**	0.732**
Branches/plant		1.000	0.880**	-0.576*	-0.613*	-0.449	0.626*	0.942**	0.234	0.513
DM			1.000	-0.707**	-0.721**	-0.529	0.592*	0.901**	0.167	0.584*
LAI				1.000	0.931**	0.774**	-0.452	-0.612*	-0.325	-0.437
LAD					1.000	0.639*	-0.433	-0.652*	-0.202	-0.496
NAR						1.000	-0.338	-0.391	-0.482	-0.332
HI							1.000	0.591*	0.689**	0.837**
Root length								1.000	0.126	0.449
Root diameter									1.000	0.525
Dry root yield										1.000

*Significant at 5 per cent level ** Significant at 1 per cent level
LA : Leaf area, LAI : Leaf area index, LAD : Leaf area duration, DM : Dry matter, HI : Harvest index, NAR : Net assimilation rate

Path coefficient analysis was worked out to get an insight into the direct and indirect effects of different characters on root yield and the results are presented in the Table 2. The results on path coefficient analysis indicated that the harvest index had the maximum direct and positive effect on dry root yield per plant followed by dry matter per plant, LAI, plant height and branches per plant. The results suggested that harvest index, dry matter per plant and leaf area index should be given top priority in the selection process due to their maximum positive direct effect on dry root yield. Similar results were reported by Himabindu *et al* (2005) in medicinal coleus. Indirect effects of other characters were also found to be significant towards the dry root yield. Harvest index had highest positive indirect effect on dry root yield through plant height followed by dry matter production per plant through root length. Root length exerted positive indirect effect through LAI, LAD and NAR towards dry root yield.

Table 2. Path coefficient analysis showing direct (underlined) and indirect effects on dry root yield in ashwagandha [Mean of two years]

Characters	Plant height(cm)	Branches/ plant	DM(g/ plant)	LAI	LAD (days)	NAR(g/ dm²/day)	HI(%)	Root length (cm)	Root diameter (cm)	Correlation with dry root yield
Plant height	**0.317**	0.040	0.352	-0.328	0.309	0.027	0.715	-0.478	-0.223	0.732**
Branches/plant	0.189	**0.068**	0.590	-0.361	0.405	0.023	0.519	-0.856	-0.064	0.513
DM	0.166	0.059	**0.671**	-0.443	0.477	0.028	0.491	-0.819	-0.046	0.584*
LAI	-0.166	-0.039	-0.474	**0.626**	-0.615	-0.040	-0.374	0.556	0.089	-0.437
LAD	-0.148	-0.042	-0.483	0.583	**-0.661**	-0.033	-0.359	0.593	0.055	-0.496
NAR	-0.164	-0.031	-0.354	0.485	-0.423	**-0.052**	-0.279	0.355	0.132	-0.332
HI	0.273	0.042	0.397	-0.283	0.287	0.018	**0.829**	-0.538	-0.189	0.837**
Root length	0.167	0.064	0.604	-0.383	0.431	0.020	0.490	**-0.909**	-0.034	0.449
Root diameter	0.258	0.016	0.112	-0.204	0.133	0.025	0.572	-0.114	**-0.274**	0.525

*Significant at 5 per cent level ** Significant at 1 per cent level Residual effect - 0.047
LAI: Leaf area index, LAD: Leaf area duration, DM: Dry matter, HI: Harvest index, NAR: Net assimilation rate

The lower values of residual effects (-0.047) indicated that 99 per cent of dry root yield was contributed by the characters studied and thus indicated the adequacy of the characters. Thus, the results of the investigation indicated that due emphasis should be given on harvest index, dry matter per plant and leaf area index for improving the dry root yield in ashwagandha.

References

Dewey, D.R. and Lu, K.H., 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. *Agron. J.*, **47**: 477-483.

Falconer, D.S.,1964. Introduction to quantitative genetics. Oliver and Boyd, Edinburg.

Gupta, A.P., Verma, R.K., Misra, H.O. and Gupta, M.M. 1996 Quantitative determination of withaferin - A different plant parts of *Withania sominifera* by TLC densitornetry. *J. Med. Arom. Plant Sci.,* **18**: 788-790.

Hedge, L. 1992. Studies on germplasm evaluation inducted autotetraploidy and hybridization in *Coleus forskohlii (*Briq). Ph.D. Thesis, University of Agricultural Sciences, Bangalore.

Himabindu, K., Veenakumari, K. and Vasanthakumar, T. 2005. Genetic variability and association between growth and tuber traits in *Coleus forskohlii (*Briq). *J. Med. Arom. Plant Sci.*, **27**: 233-237.

Kanimozhi, C., 2003. Standardization of organic production package for *Coleus forskohlii (*Briq). M.Sc.(Hort) Thesis, Tamil Nadu Agricultural University, Coimbatore.

Tripathi, A.K., Shukla, Y.N. and Kumar, S. 1996. Ashwagandha [*Withania somnifera* Dunal (Solanaceae)]: A Status Report. *J. Med. Arom. Plant Sci.,* **18:** 46-62.

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