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**Research Article**

# Character association for yield traits in *Oroxylum indicum* (L.) Vent. : A vulnerable medicinal tree

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**Abstact**
*Oroxylum indicum* (L.) Vent. is an important threatened medicinal tree. An experiment was undertaken to study the correlation and path analysis in *Oroxylum indicum* (L.) Vent. accessions during 2016-17. Correlation study revealed that number of pods per plant, leaf area, leaf width and petiole length had significant positive correlation with pod yield per plant. According to path analysis, number of pods per plant, leaf length, plant height, pod width, number of seeds per pod and number of pods per plant recorded positive and high direct effect on pod yield per plant. Thus, based on correlation and path analysis, traits *viz.* number of pods per plant and pod length can be considered as selection indices for high pod yield in this species.

**Key words**
*Oroxylum indicum* (L.) Vent., Correlation, Path analysis, Pod yield.

## Introduction

*Oroxylum indicum* (L.) Vent. belonging to family Bignoniaceae is a traditional medicine in many Asian countries as a cure for various diseases. *Oroxylum indicum* is derived from a combination of two words, *Oroxylum* means "mountain tree" and *indicum* means from India (Mccann, 1954). In India, the tree is indigenous to Eastern and Western Ghats and is also found in North- Eastern regions. It is commonly known as "Indian Trumpet Tree" due to resemblance of its flower to a trumpet. Every part of this tree possesses medicinal value (Ali *et al.,* 1998). It is ingredient in tonic formulations, such as Dasamoola and Chyawanprash (Yasodha *et al*., 2004), used in ayurvedic medicine, administered as an astringent, bitter tonic, stomachic, and anodyne. The existence of *O. indicum* in natural population is highly threatened and has been categorized as vulnerable by the Foundation for Revitalization of Local Health Traditions (FRLHT) (Ravikumar and Ved, 2000). Destructive and non-sustainable collection methods coupled with low regeneration and habitat destruction have posed serious threat to the survival and availability of this highly useful tree (Yasodha *et al.,* 2004).

Crop improvement studies on this vulnerable species are very less. Crop improvement programme initiated through selection will help in future breeding programme and the improvement of this species is through selection which in turn depends on the interrelationship of the number of component

characters. In our present study, an attempt was made to evaluate the direct and indirect association among the various variables of ten accessions of *O. indicum* through correlation and path analysis.

## Material and Methods

The experiment was conducted at the ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru during 2016-17, in a Randomized Block Design (RBD) with four replications. Ten accessions (IC 570224, IC 570225, IC 570226, IC 570227, IC 570228, IC 570229, IC 570230, IC 570231, IC 570232 and IC 570233) were collected from wild sources of different places and maintained in the Field Gene Bank (Fig 1.) were used for the study. Recommended cultural practices were followed for proper growth of the plants (Kurian and Sankara, 2007).

Observations were recorded for ten characters from all the replications, belonging to different accessions with various morphology. Data were put to statistical analysis as per Panse and Sukhatme (1967). Correlation analysis was carried out as per the formulae suggested by Fisher (1954).

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**Results and Discussion**

A comparison of phenotypic and genotypic correlation obtained in the present investigation indicated that in general the association at genotypic level was stronger than that of phenotypic level. Estimates of coefficient of correlation worked out at genotypic and phenotypic levels for 12 characters are presented in Tables 1 and 2. Pod yield per plant had significant and positive association with number of pods per plant, leaf area, leaf width and petiole length at both genotypic and phenotypic level of significance. It exhibited significant negative correlation with pod length at genotypic level. A significant positive correlation was recorded between pod yield and number of pods per plant. Hence, selection should be only based on number of pods. Such observations were also reported by Tuppad *et al*. (2017) in *Holostemma ada-kodien* Schult.

Path analysis also measures the relative importance of causal factors involved. This is simply a standardized partial regression analysis, where in total correlation values were subdivided into individual causal factors.

Present investigation revealed that out of ten characters studied, number of pods per plant, leaf length, plant height, pod width, number of seeds per pod and number of pods per plant recorded positive and high direct effect on pod yield per plant at genotypic level. This indicates the true positive association with total yield per plant. Sharma and Sastry (2008) reported a high positive direct effect plant height and number of pods per plant on seed yield. While, leaf width, petiole length and leaf area showed negative direct effect.

Number of pods per plant had high direct effect and it also had high correlation coefficient with seed yield. Magnitude of correlation coefficient between a causal factor and the effect is almost equal to its direct effect. Therefore, correlation explains the true association with each character and suggests that a direct selection through this trait will be effective.

From the study, it was revealed that the yield of the plant influenced by number of pods. Similar observation was made through correlation studies also. Hence, selection for pod yield should be based on number of pods. These findings can be used for further crop improvement programme or cultivation of the plant for sustainable use.

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**Table 1. Genotypic correlation coefficient for growth and yield parameters in *O. indicum* (L.) Vent**

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **1.0000** | 0.5092** | -0.1876 | 0.2917 | 0.1507 | 0.0479 | 0.2723 | 0.1012 | -0.4678** | -0.3654* | 0.0373 |
| **2** | | **1.0000** | -0.2187 | 0.1092 | 0.1382 | -0.0072 | 0.5144** | -0.6521** | -0.5503** | -0.2631 | 0.2399 |
| **3** | | | **1.0000** | 0.8781** | 0.4729** | 0.9250** | -0.0192 | 0.1406 | 0.4917** | 0.0514 | 0.2829 |
| **4** | | | | **1.0000** | 0.2668 | 0.9639** | 0.1914 | -0.0860 | 0.1748 | -0.2488 | 0.4080** |
| **5** | | | | | **1.0000** | 0.3395* | 0.1657 | 0.4034** | 0.4098** | 0.3164* | 0.3914* |
| **6** | | | | | | **1.0000** | 0.2634 | -0.0179 | 0.2374 | -0.1174 | 0.4994** |
| **7** | | | | | | | **1.0000** | -0.6622** | -0.3469* | -0.4252** | 0.8358** |
| **8** | | | | | | | | **1.0000** | 0.5572** | 0.6522** | -0.3818* |
| **9** | | | | | | | | | **1.0000** | 0.8686** | 0.2118 |
| **10** | | | | | | | | | | **1.0000** | 0.0231 |
| **11** | | | | | | | | | | | **1.0000** |

*Significant at 5% probability (0.3119) ** Significant at 1 % probability (0.4026)

1. Plant height (m)
2. Stem girth (cm)
3. Leaf length (cm)
4. Leaf width (cm)
5. Petiole length (cm)
6. Leaf area ($cm^2$)
7. Number of pods per plant
8. Pod length (cm)
9. Pod width (cm)
10. Number of seeds per pod
11. Pod yield (kg/plant)

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**Table 2. Phenotypic correlation coefficient for growth and yield parameters in *O. indicum (*L.) Vent**

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **1.0000** | 0.4136** | -0.1230 | 0.1291 | 0.1298 | 0.0229 | 0.2222 | 0.0845 | -0.2920 | -0.2968 | 0.0472 |
| **2** | | **1.0000** | -0.1530 | -0.0653 | 0.0522 | -0.0516 | 0.3347* | -0.2043 | -0.3438* | -0.1122 | 0.2074 |
| **3** | | | **1.0000** | 0.6881** | 0.4242** | 0.8091** | -0.0412 | 0.1439 | 0.4179** | 0.0807 | 0.2681 |
| **4** | | | | **1.0000** | 0.1787 | 0.7994** | 0.1716 | -0.1043 | 0.1430 | -0.2404 | 0.3313* |
| **5** | | | | | **1.0000** | 0.2866 | 0.1460 | 0.3081 | 0.3147* | 0.2457 | 0.3714* |
| **6** | | | | | | **1.0000** | 0.2515 | -0.0674 | 0.1951 | -0.1317 | 0.4698** |
| **7** | | | | | | | **1.0000** | -0.5098** | -0.2738 | -0.3501* | 0.7964** |
| **8** | | | | | | | | **1.0000** | 0.3707* | 0.3656* | -0.2685 |
| **9** | | | | | | | | | **1.0000** | 0.6851** | 0.1373 |
| **10** | | | | | | | | | | **1.0000** | 0.0167 |
| **11** | | | | | | | | | | | **1.0000** |

*Significant at 5% probability (0.3119) ** Significant at 1 % probability (0.4026)

1. Plant height (m)
2. Stem girth (cm)
3. Leaf length (cm)
4. Leaf width (cm)
5. Petiole length (cm)
6. Leaf area ($cm^2$)
7. Number of pods per plant
8. Pod length (cm)
9. Pod width (cm)
10. Number of seeds per pod
11. Pod yield (kg/plant)

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**Table 3. Path coefficient of biometrical traits on pod yield**

| Characters | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | rG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | **0.3401** | 0.1732 | -0.0638 | 0.0992 | 0.0513 | 0.0163 | 0.0926 | 0.0344 | -0.1591 | -0.1243 | 0.0373 |
| **2** | 0.0376 | **0.0739** | -0.0162 | 0.0081 | 0.0102 | -0.0005 | 0.0380 | -0.0482 | -0.0407 | -0.0194 | 0.2399 |
| **3** | -0.2269 | -0.2646 | **1.2096** | 1.0622 | 0.5720 | 1.1189 | -0.0233 | 0.1701 | 0.5948 | 0.0622 | 0.2829 |
| **4** | -0.1219 | -0.0456 | -0.3668 | **-0.4177** | -0.1115 | -0.4026 | -0.0799 | 0.0359 | -0.0730 | 0.1039 | 0.4080 |
| **5** | -0.068 | -0.0624 | -0.2134 | -0.1204 | **-0.4512** | -0.1532 | -0.0748 | -0.1820 | -0.1849 | -0.1427 | 0.3914 |
| **6** | -0.0219 | 0.0033 | -0.4222 | -0.4399 | -0.1550 | **-0.4564** | -0.1202 | 0.0082 | -0.1083 | 0.0536 | 0.4994 |
| **7** | 0.3537 | 0.6681 | -0.0250 | 0.2486 | 0.2152 | 0.3421 | **1.2989** | -0.8602 | -0.4506 | -0.5523 | 0.8358 |
| **8** | 0.0078 | -0.0499 | 0.0108 | -0.0066 | 0.0309 | -0.0014 | -0.0507 | **0.0766** | 0.0427 | 0.0499 | -0.3818 |
| **9** | -0.1458 | -0.1715 | 0.1533 | 0.0545 | 0.1277 | 0.0740 | -0.1081 | 0.1737 | **0.3117** | 0.2708 | 0.2118 |
| **10** | -0.1174 | -0.0846 | 0.0165 | -0.0800 | 0.1017 | -0.0377 | -0.1367 | 0.2096 | 0.2792 | **0.3215** | 0.0231 |

Residual effect=0.2693 rG Genotypic correlation with pod yield per plant
Diagonal: indicates direct effect Above and below diagonal: Indirect effect

1. Plant height (m)
2. Stem girth (cm)
3. Leaf length (cm)
4. Leaf width (cm)
5. Petiole length (cm)
6. Leaf area ($cm^2$)
7. Number of pods per plant
8. Pod length (cm)
9. Pod width (cm)
10. Number of seeds per pod
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**Fig. 2. Different parts of *O. indicum* (a. inflorescence b. tender pods c. mature pods d. stem bark)**

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**Fig. 1. Field view of *Oroxylum indicum* (L.) Vent.**