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Character Association for Fruit Yield and Yield traits in *Holostemma ada-kodien* Schult. - A Vulnerable Medicinal Plant

Siddharuda Tuppad, G. Raviraja Shetty*, K. Souravi[1], P. E. Rajasekharan [1], C. S. Ravi and M. S. Sandesh

Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, Mudigere-577 132, India
[1]Division of Plant Genetic Resources, ICAR- IIHR, Bengaluru-pin code
**Email: rrshetty2059@gmail.com*

Abstract: An experiment was undertaken to study the correlation and path analysis in thirteen *Holostemma ada-kodien* accessions at ICAR-Indian Institute of Horticultural Research, Bangalore during 2015-16. Correlation study revealed that number of fruits plant^{-1} had significant positive correlation with fruit yield plant^{-1}. According to path analysis, thickness of pericarp and number of fruits plant^{-1} recorded positive and high direct effect on yield plant^{-1}. Thickness of mesocarp, leaf width, leaf length, petiole length and fruit length had high negative direct effects on yield. Thus based on correlation and path analysis, the traits viz.,number of fruits plant^{-1}, thickness pericarp and mesocarp, leaf width, leaf length, petiole length and fruit length can be considered as selection indices for high yield.

Keywords: *Holostemma ada-kodien*, Correlation, Path analysis, Fruit yield

Holostemma ada-kodien a species indigenous to India and popularly known as Jivanti or Jivani is a twiny, laticiferous perennial medicinal shrub belongs to the family Asclepiadaceae (Martin, 2003). The species is widely distributed in the tropical rain forests of the world including India, West peninsula, Srilanka and China. In India, maximum distribution is seen in the forests of Andhra Pradesh, Tamil Nadu and Western Ghats of Karnataka and Kerala. The species has got medicinal importance and traditionally the plant is used as an alternative, astringent to the bowels (Irimpan *et al*., 2011); cures ulcers, diseases of the blood, itching, leukoderma gonorrhea, (Warries *et al*., 1995) and it has ability to maintain vigour, strength and vitality. Though distributed widely throughout Southern India, the population in wild is gradually reducing due to the destructive and ruthless collection of root tubers for ayurvedic drug preparations and fruit set is a major problem in multiplying the species in wild, which has led to the species being listed as vulnerable medicinal plant in FRLHT red list (Pushparajan and Surendran, 2014).

As this is a vulnerable plant species, improvement in this species is very less, crop improvement programme initiated through selection has helped to further 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 thirteen accessions of *H. ada-kodien* through correlation and path analysis.

The experiment was conducted at the ICAR-Indian Institute of Horticultural Research (IIHR), Bengaluru. The thirteen *H. ada-kodien* accessions *viz.,* KAR RET-1,KAR RET-2, KAR RET-3, KAR RET-4, KAR RET-5, KAR RET-6, KAR RET-7, KAR RET-8, KAR RET-56, KERRET-5, KERRET-19, KERRET-28, KERRET-60 were collected from different places from wild and maintained in Field Gene Bank. Recommended cultural practices were followed for proper growth of the plants (Kurian and Sankara, 2007). Observations were recorded for eleven characters from all the replications, belonging to the different accessions. The recorded data were analyzed for correlation coefficient analysis and for path coefficient analysis as coated by (Al-jibouri *et al.,* 1958; Dewey and Lu, 1959).

The correlation study reveals the degree of interrelationship of plant characters for improvement of yield as well as important quality parameters in any breeding programme and a complex association exists among plant characters. Fruit yield was highly significant and negatively correlated with the vegetative characters *viz*., plant height, leaf length, leaf width and petiole length (Table 1). It may be due to the distribution of photosynthates to vegetative growth rather than the reproductive growth. Since the crop medicinal property is present in the root tuber, a portion of photosynthates will diverged to tuber development also. Size of the reproductive part namely thickness of mesocarp and pericarp is negatively affecting

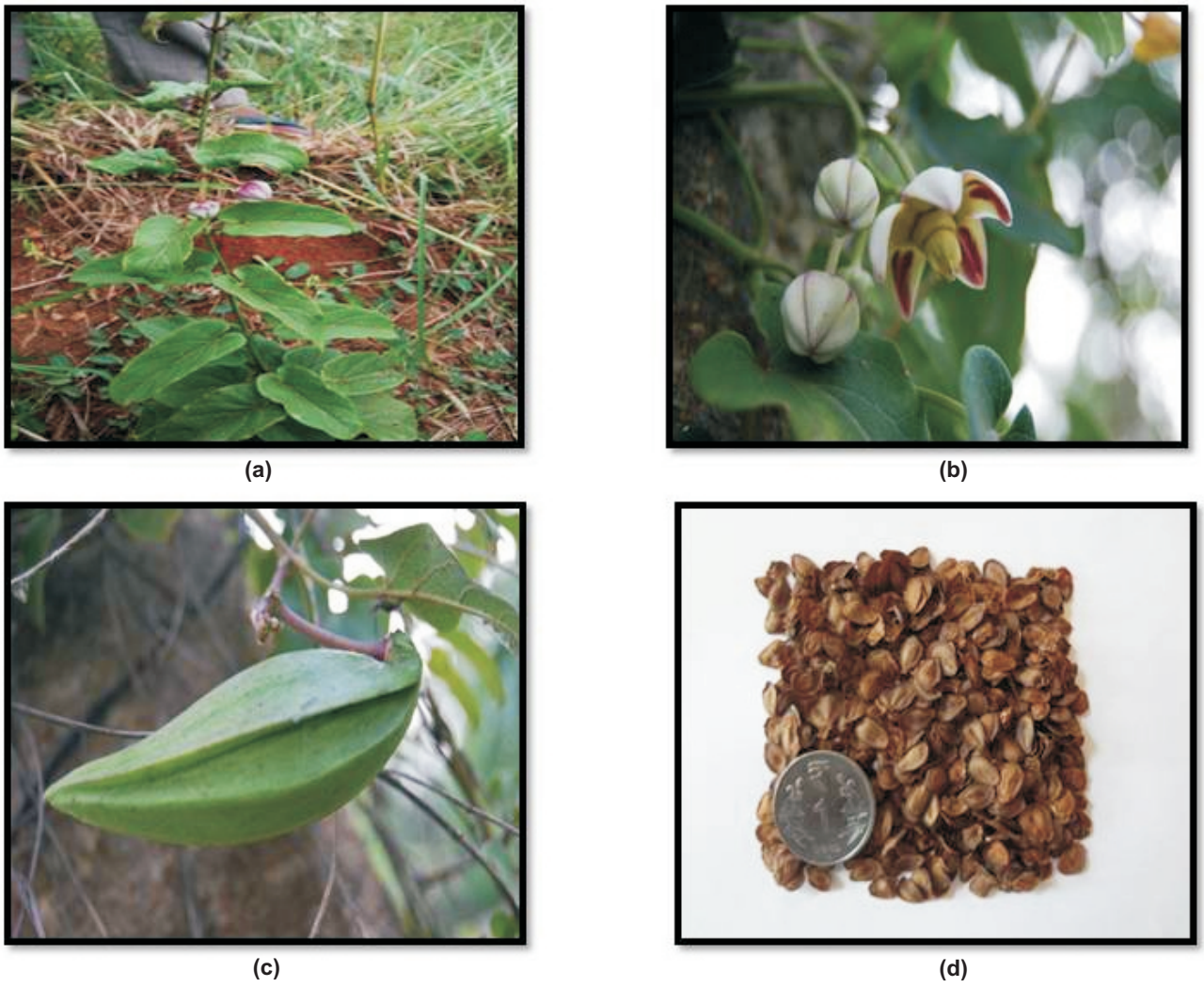

Plate 1. Jeevanti (*Holostemma ada-kodien*) a. young plant b.flowers c.fruit d. seeds

the yield. A significant positive correlation was recorded between fruit yield and number of fruits per plant. Hence, selection should be only based on number of fruits but not on size of fruits. Above mentioned characters are linear relationships with fruit yield plant^{-1} suggest that selection method of crop improvement should mainly be focused over these characteristics. The path analysis shows that the association of the independent character with dependent variable is due to their direct effect on it. If the correlation between dependent variable and independent character is due to direct effects of the character, it reflects a true relationship between them and hence selection can be made for such character to improve dependent variable. But, if the association is mainly through indirect effect of the character *i.e.,* through another component character, the breeder has to select for the later through which the direct effect is exerted. In the present experiment, path analysis was done for fruit yield plant^{-1} (Table 2). Among the ten yield components, thickness of pericarp and number of fruits per plant^{-1} recorded positive and high direct effect on yield plant^{-1}. The characters *viz*., thickness of mesocarp, leaf width, leaf length, petiole length and fruit length showed negative and high direct effect towards yield plant^{-1}. The importance of leaf length, leaf width, number of fruits plant^{-1} has been highlighted in *Jatropa curcus* by Mohapatra and Panda (2010). In our present experiment, the path analysis revealed that number of fruits plant^{-1} and thickness of pericarp were contributing to fruit yield. These two characters are contributing towards yield indirectly by lower vegetative growth.

The yield was negatively affected by leaf length and width, petiole length, fruit length, fruit diameter and thickness of mesocarp. The vegetative growth is not contributing to the reproductive development, the photosynthates produced

Table 1. Simple correlation co-efficient among important quantitative character in *Holostemma ada-kodien* accessions

	Plant height	Leaf length	Leaf width	Petiol	Pedice	Fruit length	Fruit diameter	Thickness of pericarp	Thickness of mesocarp	Number of fruits plant^{-1}	Fruit yield
Plant height	1	0.97**	0.80**	0.79**	0.26	-0.01	0.30*	0.36*	0.14	-0.89**	-0.89**
Leaf length		1	0.84**	0.79**	0.30*	-0.08	0.15	0.48**	0.24	-0.92**	-0.92**
Leaf width			1	0.84**	0.15	-0.36*	-0.15	0.27*	0.17	-0.76**	-0.80**
Petiole length				1	0.13	-0.12	0.1	0.11	-0.04	-0.72**	-0.89**
Pedicel					1	0.25	0.32*	0.31*	0.08	-0.28*	-0.30*
Fruit length						1	0.77**	-0.28*	-0.55**	0.01	0.02
Fruit diameter							1	-0.31*	-0.56**	-0.28*	-0.26
Thickness of pericarp								1	0.86**	-0.43**	-0.30*
Thickness of mesocarp									1	-0.2	-0.04
Number of fruits plant^{-1}										1	0.91**
Fruit yield											1

* Significant at 5 % probability level; ** Significant at 1 % probability level

Table 2. Path coefficient of biometrical traits on fruit yield

	Plant height	Leaf length	Leaf width	Petiole length	Pedicel length	Fruit length	Fruit diameter	Thickness of pericarp	Thickness of mesocarp	Number of fruits plant^{-1}	Fruit yield
Plant height	0.007	1.060	-0.779	-0.665	-0.030	0.006	-0.075	0.266	-0.198	-0.683	-0.89**
Leaf length	0.007	-0.726	0.816	0.666	-0.036	0.047	-0.036	-0.266	-0.198	-0.683	-0.92**
Leaf width	0.006	0.952	-0.920	-0.699	-0.018	0.238	0.038	0.197	-0.179	-0.603	-0.80**
Petiole length	0.006	0.873	-0.786	-0.818	-0.017	0.080	-0.025	0.072	0.048	-0.548	-0.89**
Pedicel length	0.002	0.333	-0.142	-0.116	-0.117	-0.164	-0.082	0.205	-0.081	-0.215	-0.30*
Fruit length	-0.000	-0.079	0.341	0.103	-0.030	-0.642	-0.195	-0.179	0.701	0.001	0.02
Fruit diameter	0.002	0.158	0.141	-0.083	-0.039	-0.509	-0.245	-0.191	0.713	-0.211	-0.26
Thickness of pericarp	0.003	0.595	-0.309	-0.101	-0.041	0.195	0.080	0.588	-1.285	-0.356	-0.30*
Thickness of mesocarp	0.001	0.300	-0.143	0.034	-0.008	0.390	0.151	0.656	-1.153	-0.176	-0.04
Number of fruits plant^{-1}	-0.006	-1.022	0.737	0.596	0.034	-0.001	0.069	-0.279	0.270	0.752	0.91**

Diagonal elements (in bold) indicates direct effect. See Table 1 for characters details

can be routed more to root tuber development and vegetative growth itself. The yield of the plant is not affected by the size of the fruits, but only through the number of fruits. Similar observation was made through correlation studies also. Hence, selection for fruit yield should be based on number of fruits rather than the size of the fruits.

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