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Character association for seed yield and yield traits in *Saraca asoca* (Roxb.) De Wilde

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Abstract
An experiment was carried out to study the correlation and path analysis in six accessions of *Saraca asoca* at ICAR-Indian Institute of Horticultural Research, Bangalore during 2016-17. Correlation study revealed that the various parameters such as plant height, leaf length, leaf width, leaf area, pod length, pod width, number of pods per plant, number of seeds per pod, seed length and seed width had high significant positive correlation with seed yield per plant. According to path analysis, plant height, leaf length, leaf width, pod length and number of pods per plant had high positive direct effect on yield per plant. Leaf area, pod width, number of seeds per pod, seed length and seed width had negative direct effects on yield. Thus based on correlation and path analysis, the traits *viz*., leaf length, leaf width, pod length and number of pods per plant may be considered as selection indices for high yield.

Keywords: *Saraca asoca*, Correlation, Path analysis, Seed yield

Introduction
Saraca asoca (Roxb.) De Wilde is an endangered medicinal plant which belongs to the family Ceasalpinaceae. It is found in the Western Ghats and Deccan plateau and also found in Central and Eastern Himalayas. It is extended up to an elevation of about 750 meter above mean sea level (Bhalerao, *et al.* 2014) [5]. It is one of the sacred plant of Hindus, and is especially sacred to the Hindu God of Love, Kamadeva (Pradhan, *et al.* 2009) [9]. It is a small ever green tree growing to a height of about 7-10 m height. Bark of the tree is economical part which is used to treat gynaecological problems (Smitha, 2013) [12].

S. asoca is one of the foremost plants utilized from antiquity till to date. It has high medicinal value and is used in many ayurvedic drugs. Ayurvedic medicine manufacturers across the country use about 2,250 tons of bark and flower annually. Hindus regard this tree as highly sacred and termed as symbol of fertility. The bark of the tree is bitter, coal, astringent and used in treatment of genitor-urinary problems, enlargement of cervical gland, thrust burning sensation, dyspepsia, piles, ulcers, menorrhagia, leucorrhoea, pimples, intestinal worms and animal poisoning. Bark contains tannins, glycosides and alkaloids (leucopelargonidin and leucocyanidin). The bark of the tree checks toxicity induced by some anti-cancer drugs, cyclophosphamide and cisplatin. It has anti-tumour, chemo-preventive and chemo-protective properties. It is used to treat snakebite. Leaves have blood-purifying properties. A combination of the juice of *S. asoca* leaves and cumin seeds cures stomach ache. In Assam, *S. asoca* fruits are chewed to control urinary discharge. Flowers are used in treating dysentery and diabetes. The famous compound preparations are Ashokaristha and Ashokaghrita (Ankur, 2015) [4].

As this is an endangered plant species globally and comes under IUCN Red list, very less attention has been paid for its improvement. The improvement of this species is through selection which in turn depends on the interrelationship of the number of component characters. In the present study an attempt was made to evaluate the direct and indirect association among the various variables of six *S. asoca* accessions through correlation and path analysis.

Materials and methods
The six accessions of *S. asoca viz.,* KARRET-201, KARRET– 214, KARRET– 216, KARRET– 219, MSSRF and CMPRwhich were maintained at ICAR- Indian Institute of Horticultural Research, Bengaluru were used for the study. Recommended cultural practice

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Were adopted for proper growth and stand of the plants.

The observations were recorded for eleven traits from all the replications, belonging to the different accessions taken in study. The characters *viz.*, plant height, leaf length, leaf width, leaf area, pod length, pod width, number of pods per plant, number of seeds per pod, seed length, seed width and seed yield. The recorded data were analysed as suggested by Al-jibouri *et al.* (1958) [3] for correlation coefficient analysis and by Deway and Lu (1959) [6] for path coefficient analysis.

Results and discussion

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 (Table 1). Seed yield per plant had high positive correlation with plant height (0.887), leaf length (0.904), leaf width (0.920), leaf area (0.938), pod length (0.954), pod width (0.758), number of pods per plant (0.992), and number of seeds per pod (0.996), seed length (0.670) and seed width (0.718). The results are in agreement with the findings of Kakaraparthi *et al.* (2013) [7], Ahmad and Khaliq, (2002) [2], Rahman *et al.* (2010) [10] who also noticed positive association of plant height, leaf length, leaf width, leaf area, fruit diameter and seed length on seed yield per plant in plants like ashwagandha, *Ocimum* and tea respectively.

Linear relationship between these mentioned characters and seed yield per plant 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 seed yield per plant (Table 2). Plant height (0.0366), leaf length (0.2512), leaf width (0.0011), pod length (0.4582) and number of pods per plant (0.8314). The importance of pod length, fruit width, leaf width, leaf length has been highlighted on plants like *Jatropa curcus*, *Piper capense,* Safed musli and *Hypericum perforatum* by Mohapatra and Panda (2010) [8], Abebe (2014) [1], Yadav *et al.* (2007) [13] and Riazi (2011) [11] respectively. The path analysis confirms the earlier studies that leaf length, leaf width, pod length and number of pods per plant are important traits that contribute to seed yield. Leaf area (-0.1853), pod width (-0.1576), number of seeds per pod (-0.1319), seed length (-0.0358) and seed width (-0.0790) had negative direct effect on seed yield per plant.

Conclusion

Hence, based on correlation and path analysis, the characters *viz.,* leaf length, leaf width, pod length and number of pods per plant may be considered as selection indices for high seed yield. Among the accessions KARRET-201 found best and hence it can be used for further crop improvement programme.

Table 1: Simple correlation co-efficient among important quantitative character in *Saraca asoca* accessions

@	1	2	3	4	5	6	7	8	9	10	11
1	1.000	0.906**	0.912**	0.892**	0.745**	0.650**	0.891**	0.884**	0.706**	0.667**	0.887**
2		1.000	0.981**	0.962**	0.765**	0.623**	0.886**	0.885**	0.517**	0.571**	0.904**
3			1.000	0.990**	0.807**	0.663**	0.909**	0.918**	0.566**	0.621**	0.920**
4				1.000	0.834**	0.625**	0.917**	0.939**	0.521**	0.579**	0.938**
5					1.000	0.850**	0.965**	0.960**	0.726**	0.804**	0.954**
6						1.000	0.829**	0.768**	0.921**	0.986**	0.758**
7							1.000	0.992**	0.921**	0.798**	0.992**
8								1.000	0.921**	0.734**	0.996**
9									1.000	0.972**	0.670**
10										1.000	0.718**
11											1.000

Critical r - 5% = 0.40431% = 0.5150 *Significant at 5% **Significant at 1% @ Characters

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

Table 2: Path coefficient of biometrical traits on seed yield

@	1	2	3	4	5	6	7	8	9	10	11
1	0.0366	0.2596	0.0010	-0.1757	0.3636	-0.1090	0.7766	-0.1217	-0.0267	-0.0598	0.887**
2	0.0378	0.2512	0.0013	-0.2061	0.4146	-0.1052	0.8265	-0.1376	-0.0219	-0.0597	0.904**
3	0.0355	0.2902	0.0011	-0.1883	0.3902	-0.1159	0.7754	-0.1228	-0.0223	-0.0604	0.920**
4	0.0347	0.2794	0.0011	-0.1853	0.3959	-0.1063	0.7873	-0.1280	-0.0209	-0.0560	0.938**
5	0.0290	0.2273	0.0001	-0.1601	0.4582	-0.1447	0.8262	-0.1330	-0.0281	-0.0745	0.954**
6	0.0253	0.1676	0.0008	-0.1249	0.4208	-0.1576	0.7228	-0.1138	-0.0356	-0.0920	0.758**
7	0.0341	0.2497	0.0011	-0.1754	0.4554	-0.1370	0.8314	-0.1342	-0.0278	-0.0757	0.992**
8	0.0337	0.0378	0.0010	-0.1798	0.4620	-0.1360	0.8458	-0.1319	-0.0268	-0.0714	0.996**
9	0.0273	0.1539	0.0007	-0.1084	0.3603	-0.1569	0.6468	-0.0987	-0.0358	-0.0898	0.670**
10	0.0277	0.1898	0.0009	-0.1312	0.4324	-0.1836	0.7967	-0.1193	-0.0407	-0.0790	0.718**

Diagonal indicates direct effect @ Characters

Residual effect = 0.2147 *Significant at 5% **Significant at 1%

1. Plant height (m) 5. Pod length (cm) 9. Seed length (cm)
2. Leaf length (cm) 6. Pod width (cm) 10. Seed width (cm)
3. Leaf width (cm) 7. Number of pods per plant 11. Seed yield (kg/plant)
4. Leaf area (cm2) 8. Number of seeds per pod

Plate 1: KARRET- 201 accession **Plate 2:** Flowers of *Saraca asoca.* Of *Saraca asoca*

Plate 3: Pods of *Saraca asoca*   **Plate 4:** Seeds of *Saraca asoca*

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