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Unshani Daryal
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

LM Gupta
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

Meenakshi Gupta
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

Punit Choudhary
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

Sarabdeep Kaur
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

Corresponding Author:
Unshani Daryal
Sher-e Kashmir University of Agricultural Sciences & Technology, Chatha, Jammu and Kashmir, India

Variation among seed sources in pod and seed traits of *Acacia catechu*

Unshani Daryal, LM Gupta, Meenakshi Gupta, Punit Choudhary and Sarabdeep Kaur

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Abstract
The present investigation, entitled "Variation among Seed Sources in Pod and Seed Traits of *Acacia catechu*" was conducted in 2024 at the Division of Silviculture and Agroforestry, SKUAST-Jammu, to assess seed source variation and identify superior seed sources. The seed sources were selected from a provenance trial established by J&KFRI at the Research Unit of Samba. Considerable variability was observed in pod and seed traits. Traits such as pod length, seed breadth and 100-seed weight and seedling biomass components emerged as reliable selection criteria. Among the evaluated seed sources, SS_{25} and SS_{14} emerged as the best performers, consistently ranking superior.

Keywords: *Acacia catechu*, seed source, variation, genetic variability

Introduction
Acacia catechu, commonly known as Khair, belongs to the Fabaceae family and occurs in tropical, subtropical and warm regions of the world (Jhilta *et al*., 2019) [1]. It is a small to medium-sized deciduous tree, attaining a height of 12-15 m and a girth of 60-90 cm, with a clear bole of 2-3 m that is usually crooked (Troup, 1921) [2]. Khair is the principal source of tannin, one of the most valuable forest products traded internationally (Singh and Lal, 2006) [3]. The heartwood yields cutch and katha, which possess significant restorative value. These products are cooling, stomach-related and astringent in nature and are used to treat ailments such as chronic diarrhea and loose bowels. Kheersal is used to treat asthma, cough and sore throat, among other chest-related problems (Kar *et al*., 2020) [4].
In Jammu & Kashmir, Khair is distributed in the districts of Kathua, Samba, Jammu, Udhampur, Reasi and Rajouri, collectively known as the rainfed Kandi belt. *Acacia catechu* grows well on degraded lands and is suitable for community plantations (Jha and Mandal, 2019) [5]. Variation in nursery performance begins with seed sowing and germination, which are influenced by pod and seed characters (Selvan and Gueleria, 2012) [6]. To promote Khair cultivation on public and private lands, the supply of high-quality planting material is essential. Therefore, the present study was undertaken to assess morphological variability among different seed sources of *Acacia catechu* to identify superior sources for farmers, researchers and tree improvement programmes.

Materials and Methods
The present study, entitled "Variation among Seed Sources in Pod and Seed Traits of *Acacia catechu*" was carried out in the Division of Silviculture & Agroforestry, Sher-e-Kashmir University of Agricultural Science and Technology, Jammu. The site is situated in the subtropical region of Jammu, Union Territory of Jammu and Kashmir, at an altitude of 332 m above mean sea level, with geographical coordinates of 32°40′ N latitude and 74°58′ E longitude. The morphological parameters of the selected seed sources, such as pod length (mm), pod breadth (mm), 100-pod weight (g), number of seeds pod^{-1}, seed length(mm), seed breadth (mm), seed thickness (mm) and 100-seed weight (g) were measured using a digital caliper and electronic weighing balance, respectively. The statistical analysis was performed on the mean values using the 'R' software.

Results and Discussion

Significant variation was observed among seed sources for all pod and seed traits (Table 1). Pod length ranged from 56.76 mm in SS_{17} to 82.72 mm in SS_{25}. The maximum pod breadth (14.09 mm) was recorded in SS_{20}, while the minimum (11.23 mm) occurred in SS_{10}. The highest 100-pod weight was observed in SS_{16} (23.34 g), whereas the lowest was recorded in SS_{17} (18.37 g). The number of seeds pod^{-1} varied from 2.58 in SS_{09} to 4.65 in SS_{20}. Seed length ranged from 6.01 mm (SS_{10}) to 7.79 mm (SS_{25}), while seed breadth varied between 4.85 mm (SS_{02}) and 6.86 mm (SS_{25}). Seed thickness ranged from 1.11 mm in SS_{17} to 1.60 mm in SS_{25}. The highest 100-seed weight was recorded in SS_{20} (3.65 g), whereas the lowest was observed in SS_{17} (2.28 g). The present findings are in agreement with Todaria *et al*. (2004) [7], who reported considerable diversity among *Acacia catechu* seed sources. Similar trends of variation have also been reported in *A. catechu* by Gera and Gera (2012) [8], Kumar *et al*. (2004) [9] and Selvan and Guleria (2012) [10].

Table 1: Variation in pod and seed traits among seed sources

Seed sources	Pod length (mm)	Pod breadth (mm)	100-Pod weight (g)	Number of seeds pod^{-1}	Seed length (mm)	Seed breadth (mm)	Seed thickness (mm)	100-Seed weight (g)
SS_{02}	64.93^{d}	13.07^{bcd}	18.90^{d}	4.48^{ab}	6.86^{cd}	4.85^{e}	1.18^{de}	2.73^{d}
SS_{09}	68.02^{cd}	12.53^{cde}	18.72^{d}	2.58^{f}	7.11^{bc}	5.78^{b}	1.38^{bc}	3.26^{bc}
SS_{10}	67.55^{cd}	11.23^{f}	22.32^{abc}	3.80^{cd}	6.01^{f}	4.93^{de}	1.17^{de}	2.74^{d}
SS_{11}	56.77^{e}	12.46^{cde}	18.59^{d}	3.40^{cd}	6.61^{de}	5.46^{c}	1.27^{cd}	3.09^{c}
SS_{14}	70.21^{c}	11.53^{ef}	21.39^{c}	3.18^{e}	6.75^{cde}	5.43^{c}	1.42^{bc}	2.55^{de}
SS_{16}	82.04^{a}	13.71^{ab}	23.34^{a}	4.14^{bc}	7.09^{bcd}	5.46^{c}	1.59^{a}	3.25^{bc}
SS_{17}	56.76^{e}	12.18^{def}	18.37^{d}	3.40^{de}	6.36^{ef}	5.12^{d}	1.11^{e}	2.28^{e}
SS_{20}	70.69^{c}	14.09^{a}	22.33^{abc}	4.65^{a}	7.34^{ab}	5.12^{d}	1.46^{ab}	3.65^{a}
SS_{22}	75.17^{b}	13.29^{abc}	21.53^{bc}	4.55^{ab}	6.86^{bcd}	4.99^{de}	1.35^{bc}	3.39^{ab}
SS_{25}	82.72b^{a}	12.83^{bcd}	22.59^{ab}	4.25^{abc}	7.79^{a}	6.86^{a}	1.60^{a}	3.64^{a}
Mean	69.49	12.69	20.81	3.84	6.88	5.40	1.35	3.06
$CD_{0.05}$	3.79	1.04	1.12	0.49	0.51	0.21	0.14	0.30

*SS- seed source

Conclusion

The study concludes that SS_{25} and SS_{14} are identified as superior and recommended for plantation, agroforestry and tree improvement programmes, owing to their consistent performance across key pod, seed and genetic parameters, which makes them suitable for large-scale deployment and quality planting material production.

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