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Seed Source Variation for Germination in Different Half Sib Families of *Acacia Nilotica* (Linn.) in Suitable Environmental Conditions

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ABSTRACT

The genetic divergence was studied in the output of twenty phenotypically superior trees in Uttar Pradesh's natural distribution region. Based on morphological and biomass qualities, twenty predominant tree descendants were assembled into eight clusters dependent on the relative of D2 esteems. Cluster I had the most superior tree progenies, with six in all. Cluster II had the greatest intra-cluster gap (3.171), indicating that its progenies were more complex than those of the other clusters. Between clusters I and III, the maximum inter D2 value was obtained (18.275). This current examination's clustering design showed that predominant tree children from different geographic areas were grouped together in a bunch, and the other way around, suggesting that geographic variety doesn't generally infer hereditary variety. The contribution of various traits to diversity showed that seedling height had the greatest impact on separation. The assessment moreover showed that the phenotypic coefficient of variation (PCV) was higher than the comparing genotypic coefficient of variation (GCV) for all the morphological and biomass ascribes which uncovered that the attributes were unpretentious to characteristic changes. The characteristics with low hereditary addition and high heritability demonstrate that the articulation is conceivably constrained by Intra and Inter allelic associations. The hybridization between the more varying genotype of Acacia nilotica can make genotypes with high heterotic vigour.

Keywords: D^2 , Cluster, *Acacia nilotica*, Heritability, PCV, GCV.

Introduction

Seeds afford the most regular assets of plant proliferation, safeguarding of hereditary changeability, transportation, and engendering of vegetation. However, suitable seeds don't grow significantly under great ecological conditions for some cases; this marvel is named seed torpidity. Cone and seed characteristics have been seemed to contrast among species, provenance and genotypes in pines and are particularly filed by Singh et al., (1996) and Thapliyal and Dhiman (1997). Cone size (length and width) and seed size (length, width and weight) have been used for intra-express arranged capability between people in *Pinusgregii* (Donahue and Upton, 1996), while limits like seed weight and length are important for portraying provenances into high and bog bundles in *P. caribea* (Salazar, 1986).

Environmental components in blend in with inherited and physiological ones accept critical part in choosing a woodland tree's potential for seed quality, by choosing its blooming limit force and periodicity of blossoming and productivity of seed. Along these lines, characters of seed quality appear under strong innate control. Dependent upon the species, germination responses of seed contrast according to scope, rise, soil sogginess, soil supplement, temperature, kind and thickness of plant cover and level of living space agitating impact of the site where the seeds developed.

Acacia nilotica Linn. (Babul or Desi babul), is a medium measured, prickly, almost evergreen tree that can reach up to 20-25 m tallness however may stay a bush in helpless developing conditions (Orwa and Ecocarp, 2009; Fagg and Orwa, 2005) has a place with family Leguminoceae. *Acacia nilotica* began from Africa and the Indian subcontinent it is currently

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usually found or developed with in practically all tropical and subtropical spaces of Africa, Asia, Australia (Brenan, 1983). *Acacia nilotica* is a multipurpose tree; it gives lumber, fuel, food, conceal, grain, nectar, color, gum and fences. It additionally impacts on the climate through soil recovery, soil advancement, insurance against fire and wind, and as an asylum for biodiversity and trimming. It is broadly utilized in ethno-medication (Gupta et al., 2020). The crown might be leveled or adjusted. The leaves are 5-15 cm long. Substitute and compound with 7 to 36 sets of curved, 1.5-7 mm long 0.5-2 mm expansive, dim green shaggy leafless. Their cases suffer a heart attack "accessory" shape with narrowing between the seeds.
Acacia nilotica ought not to be brought into muggy and sub-damp territories, or into dry zones where there are satisfactory supplies of brushing and fuel wood. *Acacia nilotica* is a pioneer variety that is moderately quickly developing on dry destinations. It is a significant riverine tree in India, Sudan and Senegal, where it is planted for wood. Acacia nilotica blossoms at a generally youthful age, around three to four years of age in ideal conditions, on flow season development during the blustery season. Blooming is productive, and can happen number of times during the year, contingent upon the accessibility of soil dampness. Pinnacle blooming seems to happen from October-December and pinnacle fruiting around April-June. Fruiting tops in January for under condition it June to September and some of the time in December/January, and the mature natural product from April to June.

Mammalian herbivorous warm blooded animals scatter seeds. Bark, gum, leaves, and cases are utilized restoratively for malignancies and additionally tumors (or ear, eye, or balls) and treatment of the liver and spleen. The biggest, simplest, and fastest gains in most woodland tree improvement ventures would gather if the utilization of appropriate species and seed sources inside species is guaranteed, paying little mind to how refined the reproducing strategies are (Zobel and Talbert, 1984). Accordingly, provenance research is critical. A region of an animal categories is described collectively of hereditarily comparable people who are connected by basic plunge and live in a particular domain to which they have adjusted through characteristic choice. Thus, the current investigation was led at College of Forestry, SHUATS, Prayagraj, to appraise seed source variety in various half sib groups of *A. nilotica* populaces under appropriate ecological conditions.

Materials and Methods

The current research was carried out at the College of Forestry, SHUATS, Prayagraj, to determine the genetic divergence in Acacia nilotica pod and seed characters obtained from various locations in Uttar Pradesh. One population of trees was known to be those growing in a one population. Twenty separate locations were chosen as superior trees, with five trees chosen at random from each site. Every stand was represented by a superior tree and four comparison trees of nearly similar size that were free of insect pests and diseases, and morphological observations were recorded for both comparison and superior trees. For pod and seed character observations, 10 pods/tree were randomly collected from various parts of the tree, and an average of 10 pods and 10 seeds measurements were reported for pod and seed length, respectively. The best of these five trees was chosen as the superior tree and labelled with a yellow paint sign. In the months of April and June, twenty superior trees were identified and their pods were collected. For CPTs chosen from 20 different places, GPS was used to determine latitude and longitude. The pods

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were washed and placed in muslin with details about the Superior Trees that were chosen (Table 1).

A total of 300 healthy pods were collected, with one hundred from each batch. Pod length, pod width, and pod thickness were measured on an average of 10 pods and expressed in millimeters. Pod damage was measured as a percentage of the total number of damaged pods in each replication.

Subsequent to taking the perceptions on units, seeds were extricated from haphazardly chose cases in addition to tree was saved replication shrewd for taking perceptions on seeds. The normal of 10 seeds estimations was recorded for seed length, seed width and seed thickness and communicated in mm and 100-seed weight in gram. All case and seed characters were estimated with the assistance of computerized vernier caliper while, 100-seed weight were recorded with the assistance of electronic gauging balance. To examine the hereditary dissimilarity in seed source the perceptions recorded were exposed to measurable investigation by Burton and Devane (1953) and Johnson et al. (1955).

Table1: Details of location, latitude, longitude, elevation (m) of superior genetic resources of *Acacia nilotica* seed sources.

S. No.	Seed Sources	Altitude (m)	Range of Temp. ºC	Latitude (ºN)	Longitude (ºE)	Rainfall (mm)
S_1	Farrukhabad	167	35-45	27º38'N	79 º59'E	896.2
S_2	Kannauj	143	30-45	27º05'N	79º91'E	868
S_3	Allahabad	98	32-46	25º45'N	81º84'E	1027
S_4	Kanpur(c.s.a.)	126	25-45	26º49'N	80º30'E	820
S_5	Rawatpur	126	25-45	26º44'N	80º33'E	820
S_6	Barra	128	25-45	26º42'N	80º29'E	825
S_7	Bareilly	268	21-45	28º36'N	79º43'E	1093
S8	Shuats	98	20-45	25º41'N	81º84'E	1100
S_9	Gonda	111	25-46	27º03'N	81º95'E	1240
S_{10}	Banaras	76	26-45	25º31'N	82º97'E	998
S_{11}	Lucknow	121	24-45	26º84'N	80º94'E	1001

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S_{12}	Delhi	215	24-46	28º70'N	77º10'E	693
S_{13}	Fatehpur	124	25-44	25º85'N	80º89'E	1052
S_{14}	Unnao	131	24-46	26º53'N	80º48'E	850
S_{15}	Meerut	226	24-46	28º98'N	77º70'E	933
S_{16}	Sitapur	141	25-45	27º58'N	80º66'E	1193
S_{17}	Pukhraya	130	25-43	26º22'N	79º83'E	1015
S_{18}	Hardoi	147	26-45	27º29'N	79º83'E	1103
S_{19}	Faizabad	104	26-45	26º77'N	82º14'E	1143
S_{20}	Nursury	98	27-44	25º41'N	81º84'E	1027

Result and Discussion

The investigation of fluctuation the presence of critical contrast among the unrivaled tree descendants for every one of the qualities contemplated, showing the presence of hereditary changeability. In view of the general extent of D2 esteems twenty predominant trees descendants were gathered eight bunches based on morphological and biomass characteristics (Table 2). Group I showed the most noteworthy number of six predominant tree descendants followed by Cluster IV which included three Cluster II and III included two separately.

Table 2. Distribution of twenty superior tree progenies in different clusters based on D^2 statistics

Cluster	Total number of tree in each cluster	Notation of tree
I	6	S1, S2, S3, S4, S5, S20
II	2	S9, S10
III	2	S7, S15
IV	3	S6, S8, S14
V	2	S13, S19

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VI	2	S16, S18
VII	2	S11, S12
VIII	1	S17

Plus, superior tree progenies from various locations can be found in the same cluster (superior tree progenies S1, S2, S3, S4, S5, S20 in cluster I; S9, S10 in cluster II; S7, S17 in cluster III; S6, S8, S14 in cluster IV; S13, S19 in cluster V; S16, S18 in cluster VI, S11, S12 in cluster VII; S17 in cluster VIII) (Table 2).This shows their nearby proclivity. The dispersion of descendants in various clusters shows that, despite the fact that the genotypes were chosen from various ecogeographic regions the hereditary cosmetics alongside rearing framework, heterogeneity, hereditary float, characteristic and unidirectional choice pressing factor should be the reason for hereditary variety among various descendants other than geographic variety somewhat (Gupta et al., 2020). The cluster design demonstrated that topographical variety need not really be identified with hereditary variety. Thusly, determination of genotypes for hybridization might be made based on hereditary the finding in *Gliricidiasepium* and *Sorbustorminalis*(Salazar, 1986; Bednorz et al; 2006).

The magnitude of the inter and intra cluster among the superior progenies varied (Table 3). Cluster I had the highest intra-cluster diversity (3.171), indicating that its progenies were more diverse than those of the other clusters. Cluster II has the greatest intra cluster gap (1.354).Cluster III and IV (5.511) had the highest Inter cluster D2 value, followed by Cluster III and IV (5.511). (5.324). Cluster I and V had a minimum distance of 3.111, indicating that the trees in these clusters were relatively close together.The clustering design in this investigation uncovered the predominant tree descendants from various geographic area were gathered in a group and the other way around recommending that topographical variety didn't really address the hereditary variety. Wani and Chauhan (2007) announced that the elements other than topographical variety may be answerable for their hereditary consistency. The trees/provenances that started in one locale had been dispersed into various groups demonstrated the trees with same geographic cause might have gone through change for various characters under choice.

Table 3. Average inter and intra cluster distances (D^2 values) among twenty superior tree progenies.

Cluster	I	II	III	IV	V	VI	VII	VIII
I	3.171	3.331	4.275	3.555	3.111	4.438	3.854	4.232
II		1.354	3.908	3.846	3.821	3.700	3.358	4.188
III			2.206	5.511	4.492	4.554	5.324	5.92
IV				3.417	3.504	5.120	3.884	4.979
V					3.133	3.995	4.347	4.771
VI						3.238	5.014	5.462

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VII							3.386	4.854
VIII								0

When the cluster means for ten characters (Table 4) were compared, it was clear that different characters differed significantly between clusters. Cluster III had the highest seedling height (39.97). Table 4 shows the contribution of various traits to diversity, including collar diameter (1.84), inter-nodal length (1.84), fresh shoot weight (0.29), and fresh root weight (0.13).

Table 4. Details of morphological observations and other relevant information for 20 Superior trees of *Acacia nilotica*Linn.

	Germination %	Seedling height	Collar diameter	Internodal length	Fresh shoot weight	Fresh root weight	Dry shoot weight	Dry root weight	Shoot/root ratio	Seedling biomass
I	62.747	37.138	1.827	2.505	0.282	0.127	0.189	0.066	2.910	0.416
II	59.483	34.033	1.815	2.660	0.265	0.120	0.185	0.070	2.880	0.388
III	64.783	39.977	1.827	2.593	0.255	0.125	0.158	0.060	2.600	0.395
IV	66.228	36.808	1.820	2.620	0.290	0.123	0.207	0.070	3.050	0.418
V	66.042	34.702	1.832	2.515	0.283	0.130	0.183	0.075	2.560	0.413
VI	62.917	31.942	1.822	2.545	0.245	0.130	0.188	0.078	2.470	0.425
VII	56.667	38.112	1.840	2.675	0.280	0.120	0.195	0.070	2.900	0.443
VIII	58.333	34.400	1.820	2.427	0.290	0.120	0.210	0.047	3.060	0.430

Fig 1 shows different percent contribution for different traits in *Acacia nilotica* where Seedling height contribution the maximum (4.21%) followed by germination % (3.68%), inter-nodal length (4.74%), fresh shoot weight (18.42%), fresh root weight (4.21%), dry shoot weight (8.95%), dry root weight (11.58%), shoot/root ratio (20.00%), seedling biomass (24.21%).

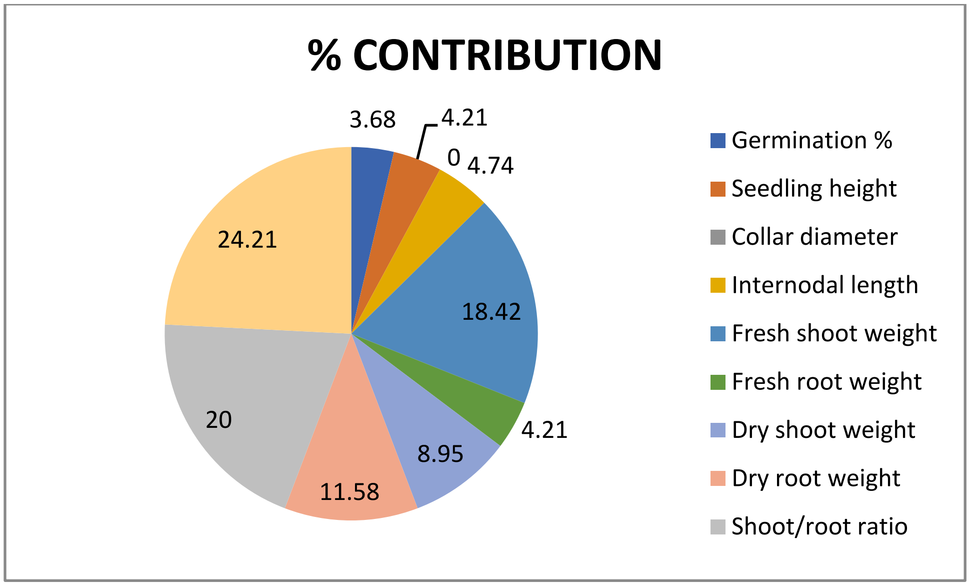

Figure 1. Per cent contribution for different traits in *Acacia nilotica.*

Heritability gives a proportion of hereditary variety whereupon every one of the potential outcomes of changing the hereditary sythesis of the species depend. As such information on its greatness gives a thought regarding the degree for influencing hereditary improvement through determination and so forth while hereditary additions gives relative estimation of progress delivered by choice in mean hereditary level of the species. The appraisals of hereditary boundaries (Table 5) showed that shoot/root proportion had most extreme PCV (12.76%) trailed by seedling stature (11.80) and dry root weight (10.81%). The most elevated GCV was shown by dry root weight (8.05%) trailed by dry shoot weight (7.12%) and shoot/root proportion (6.57%). Estimates of heritability (broad sense) were highest for dry root weight (55.47%), shoot/root weight (26.54%), shoot fresh weight (58.87%), seedling biomass (4.30%).

Table 5. Progeny variability parameters for germination percent of 20 different superior trees of *Acacia nilotica (*Field environment)

Parameters Traits	Mean	Range	Coefficient of Variability		heritability	Genetic Advanc	Genetic Gain
			Phenotypic (PCV)	**Genotypic (GCV)**			
Germination %	62.63	55.67-68.30	7.96	3.81	22.92	2.35	3.76
Seedling height	36.26	27.35-40.17	11.80	5.79	24.06	2.12	5.85
Collar diameter	1.83	1.80-1.85	0.99	0.52	27.74	0.01	0.56
Inter-nodal length	2.56	2.39-2.74	5.55	3.01	29.52	0.08	3.37

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Fresh shoot weight	0.28	0.24-0.30	7.26	5.57	58.87	0.02	8.80
Fresh root weight	0.12	0.11-0.13	6.61	3.19	23.29	0.00	3.17
Dry shoot weight	0.19	0.16-0.21	11.05	7.12	41.57	0.01	9.46
Dry root weight	0.7	0.06-0.08	10.81	8.05	55.47	0.00	12.35
Shoot/root ratio	2.83	2.35-3.25	12.76	6.57	26.54	0.19	6.98
Seedling biomass	0.40	0.37-0.44	6.19	4.30	48.27	0.02	6.16

Dry root weight (12.35 percent) had the highest genetic advantage, followed by dry shoot weight (9.46 percent) and fresh shoot weight (8.80 percent). For most of the characteristics, PCV values were higher than GCV values, indicating that they are heavily affected by the climate.The effects of the environment on the expression of morphology and biomass traits in *Pinusroxburghii*and*Alnusnitida* have been recorded (Rathore et al., 2008). Subsequently, ecological variables ought to be viewed as while choosing these characters for additional turn of events. Moderate to low heritability and hereditary development in shoot new weight, shoot dry weight, root new weight and dry weight demonstrate that heritability in these attributes is essentially because of non-added substance quality connection in the legacy of these characteristics and enhancements could be brought thoroughly considered heterosis rearing. The current outcome validates the discoveries in *Pinusroxburghii*, linseed and *Prosopis cineraria* (Murthy et al., 1973).

Conclusion

Based on morphological and biomass attributes, twenty prevalent tree descendants were partitioned into eight groups, with bunch I showing the most noteworthy number and greatest Intra cluster distance, recommending that descendants in this group were more different than those in different bunches. In contrast with different groups I and III, the most noteworthy bury cluster D2 esteem was obtained.This study's clustering trend showed that regional diversity did not always correspond to genetic diversity.Seedling height was the most important factor in divergence. Since the PCV was higher than the GCV, the traits were more prone to environmental changes. Hybridization of *Diospyrosmelanoxylon* genotypes with more diverse genotypes will lead to genotypes with high heterotic vigour.

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