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Genetic variability and correlation analysis for yield related traits in *Amaranthus* (*Amaranthus* spp.)

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Abstract

The field experiment was conducted to study the “Genetic Variability and Correlation Analysis for yield related traits in *Amaranthus* (*Amaranthus* spp.)” was conducted at the Department of Horticulture, College of Agriculture, Indore (M.P.) during Rabi 2024-25. Eleven genotypes of *Amaranthus* were evaluated in a Randomized Block Design with three replications to assess genetic variability for yield and related traits. Full-size variations have been located amongst genotypes for all characters, indicating huge genetic variability. Correlation coefficients had been estimated among yield and its factor tendencies at phenotypic and genotypic degrees to understand the inter-relationship among the characters. It presents records approximately the character, volume and direction of selection strain to be implemented for realistic attention. Excessive heritability coupled with slight genetic advance was recorded for developments which include plant peak, stem diameter, and wide variety of branches according to plant, suggesting additive gene movement. Vast and advantageous correlation changed into observed for leaf yield per hectare (quintal) with seed yield in keeping with hectare (q), seed yield in keeping with plant, harvesting index, leaf region, sparkling weight of leaf, leaf width at harvest, no of inflorescence per plant at harvest, no of leaves according to plant at harvest. On the basis of mean performance of the genotypes, large range was observed for most of the traits under study. It was observed that leaf yield per hectare (quintal) varied from 45.92 qt/ha (*AMARANTHUS VIRIDIS*) to 127.34 qt. (*INDORE-AMA 17-18-133*) with mean of 75.03 qt. seed yield per hectare (quintal) varied from 1.26 qt (*AMARANTHUS VIRIDIS*) to 3.84 qt (*INDORE-AMA 17-18-104*) with mean of 2.7 qt. Significant positive correlation found with leaf yield per plant (g) (1.000) followed by fresh weight of leaf (g) (0.953), leaf area (cm²) (0.811), harvest index (%) (0.751), seed yield per plant (g) (0.670), seed yield per ha (q) (0.659), number of leaves per plant (0.637), number of inflorescences per plant (0.617) and leaf width (cm) (0.368).

Keywords: Genetic variability, correlation, heritability, yield, *Amaranthus*, traits

Introduction

The word “Amaranth” is basically derived from Greek word “Anthos” which means “everlasting”. *Amaranthus* or chaulai (*Amaranthus* spp.) is a very popular leafy vegetable in India as well as in tropical and sub-tropical areas of sphere. It belongs to the Amaranthaceae family, subfamily Amaranthoideae and genus *Amaranthus*. The crop *amaranthus* originated from Central and South America to (Rezwana *et al.* 2017) [11]. The genus *Amaranthus* includes 50-60 species, cultivated for leaf as well as for grains and few are wild species. The vegetable *amaranth* species (2n = 34) include *A. tricolor*, *A. dubius*, *A. lividus*, *A. blitum*, *A. tristis*, and *A. viridis*, while grain types (2n = 32) includes *A. cruentus*, *A. caudatus* and *A. spinosus*. Centres of diversity for *amaranth* are Central and South America, India and South East Asia with secondary centres of diversity in West and East Africa. In India, *amaranth* is grown in about 40,000-50,000 hectares. It's mainly cultivated in the hilly regions of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Tripura, Jharkhand, Chhattisgarh, Maharashtra, Gujarat, Odisha, Karnataka, and Kerala (Department of Agriculture and farmer welfare 2023).

It is widely cultivated for both grains and greens in highly diverse areas from tropical low land to the elevation of 3500 m in the Himalayas and in South Indian hills (Yadav and Mina, 2019) [6].

It is an extraordinarily nutritious exquisite meal rich in protein, carbohydrates, nutritional fibers, calcium, iron, manganese, zinc, vitamin-A, vitamin-C, diet-ok, riboflavin, niacin, diet-B6 and folate which permit the crop to combat mal-nutrition. Considering the potentiality of this crop, there may be a need of improvement of suitable types for cultivation underneath precise agro-ecological situations. The phenotypic expression of the plant characters is frequently governed by means of genetic makeup of the genotype, surroundings and their interaction effects. Similarly, the genetic variance of any quantitative trait consists of additive variance (heritable) and non-additive variance which consist of dominance and epistasis (non-allelic interplay). Consequently, it turns into necessary to partition the determined phenotypic variability into its heritable and non-heritable components with suitable parameters which include genotypic and phenotypic coefficient of variation, heritability and genetic development. To present a better perception of ancillary characters under choice, correlation coefficient analysis is the tool that is being effectively used for determining the price of numerous yield additives in distinct genotypes, main to the choice of advanced genotypes.

Materials and Methods

The field experiment on amaranthus was conducted during the Rabi season of 2024-25 at the Department of Horticulture, College of Agriculture, RVSKVV, Indore (M.P.), located at 22.43° N latitude, 75.66° E longitude, and 555.5 m above MSL. The experiment was laid out in a Randomized Block Design (RBD) with 11 genotypes *Amaranthus viridis*, *Amaranthus cruentus*, SHIVPURI AMARANTHUS 17-18-119, NEEMUCH AMA-17-18-113, MORENA AMA 17-18-110, KERELA AMA 17-18-102, INDORE AMA 17-18-133, SEHORE AMA 17-18-122, INDORE AMA 17-18-104, ARKA Suguna, ARUN RED 02-047-11-TLR-19-07 of *Amaranthus* (*Amaranthus* spp.) and three replications. Each plot measured 2.25 × 2.25 m with a spacing of 45 × 15 cm. A basal dose of FYM (25 t/ha) and N:P:K (75:50:25 kg/ha) was applied, and recommended agronomic practices were followed uniformly. Sowing was done on 2 December 2024, and harvesting on 15 May 2025. Statistical analysis was performed using ANOVA (Panse and Sukhatme, 1957). Genotypic and phenotypic coefficients of variation (Burton & Devane, 1953), heritability and genetic advance (Johnson *et al.*, 1955). To determine the degree of association of foliage yield with its attributing characters as well as among the yield attributing characters, the correlation coefficients were calculated.

Result and Discussion

Genetic Variability

The variance due to genotypes was highly significant for all the traits. (Table 1). On the basis of mean performance of the genotypes, wide range was observed for most of the traits under study. (Appendices Ia and Ib). It was observed that mean value for Leaf yield and seed yield was 75.03 qt/ha and 2.7 kg/ha. Range value for Leaf yield was 45.92 qt/ha (AMARANTHUS VIRIDIS) to 127.34 qt/ha (INDORE AMA 17-18-133) range value for seed yield was 1.26 kg/ha (AMARANTHUS VIRIDIS) to 3.84 kg/ha (INDORE AMA 17-18-104). These findings are similar with the results of Mandal and Dhangra (2007) [3] and for Bankura Collection 3 and Bolpur Collection 1 produced

highest yield per ha. The PCV% value is higher than GCV% for all the traits under study. The GCV% has recorded highest for panicle breadth (cm) (47.92%) followed by fresh weight of leaf per plant (g) (45.14%), leaf yield per plant (g) (38.58%), leaf yield per ha (q) (38.56%), number of branches per plant (33.57%), seed yield per ha (q) (31.67%), seed yield per plant (g) (31.59%), stem diameter (cm) (30.75%), number of leaves per plant (30.40%), leaf area (cm²) (27.10%), fresh weight of shoot per plant (g) (26.36%), plant height (cm) (22.65%), leaf width (cm) (22.17%), dry weight of shoot & root (g) (21.01%), leaf length (cm) (20.99%) and leaf: stem ratio (20.74%). The PCV% has recorded highest for panicle breadth (cm) (78.86%) followed by fresh weight of leaf per plant (g) (45.88%), leaf yield per plant (g) (38.88%), leaf yield per ha (q) (38.86%), number of leaves per plant (35.25%), number of branches per plant (33.94%), seed yield per ha (q) (32.15%), seed yield per plant (kg) (32.07%), stem diameter (31.78%), leaf stem ratio (29.39%), leaf area (cm²) (28.25%), fresh weight of shoot per plant (g) (26.49%), plant height (cm) (22.82%), leaf width (cm) (22.67%), dry weight of root and shoot (g) (22.01%) and number of inflorescence per plant (22.00%).

High heritability estimated for plant height (cm), fresh weight of shoot per plant (g) and leaf yield per ha (q) (99.00%) followed by number of branches per plant and leaf yield per plant (g) (98.00%), leaf length (cm), fresh weight of leaf (g), test weight (g), seed yield per plant (g), and seed yield per ha (q) (97.00%), leaf width (cm) (96.00%), stem diameter (cm) (94.00%), leaf area (cm²) (92.00%), dry weight of root and shoot (g) (91.00%), harvest index (90.00%), panicle length (cm) (86.00%), fresh weight of root per plant (g) (85.00%), days to initiation of first inflorescence (83.00%), number of inflorescence per plant (78.00%) and number of leaves per plant (74.00%). The highest genetic advance as percentage of mean was recorded for fresh weight of leaf (g) (91.48%) followed by leaf yield per plant (g) (78.85%), leaf yield per ha (q) (78.82%), number of branches per plant (68.39%), seed yield per ha (q) (64.25%), seed yield per plant (g) (64.11%), stem diameter (cm) (61.30%), fresh weight of shoot per plant (g) (54.04%), number of leaves per plant (54.00%), leaf area (cm²) (53.53%), plant height (cm) (46.31%), leaf width (cm) (44.68%), leaf length (cm) (42.48%), dry weight of shoot & root (g) (41.31%) and number of inflorescence per plant (35.43%).

Correlation coefficient analysis

Correlation coefficients have been expected between yield and its aspect trends at phenotypic and genotypic degrees to recognise the inter-relationship of some of the characters. It gives facts approximately the nature, extent and route of choice stress to be applied for practical consideration. The outcomes of phenotypic correlation coefficients had been mentioned handiest because the genotypic and environmental correlation were basically influenced with the aid of the environmental conditions, therefore phenotypic correlation will give the suitable concept approximately the association among variables. (Table 2a and 2b)

Plant height (cm) 30 DAS exhibited strong significant and positive association with stem diameter (cm) (0.953), Stem diameter (cm) expressed highly significant and positive correlation with number of branches per plant (0.959), Fresh weight of leaf per plant had significant positive association

with leaf yield per ha (q) (0.953) and leaf yield per plant (g) (0.953) followed by leaf area (cm²) (0.796), harvest index (%) (0.705), seed yield per plant (g) (0.626), seed yield per ha (q) (0.691) and leaf stem ratio (0.474). Harvest index (%) had significant and positive correlation with leaf yield per ha (q) (0.751) followed by leaf yield per plant (g) (0.750), seed yield per plant (g) (0.699) and seed yield per ha (q) (0.699).

It showed significant positive correlation with leaf yield per plant (g) (1.000) followed by fresh weight of leaf (g) (0.953), leaf area (cm²) (0.811), harvest index (%) (0.751),

seed yield per plant (g) (0.670), seed yield per ha (q) (0.659), number of leaves per plant (0.637), number of inflorescences per plant (0.617) and leaf width (cm) (0.368). Whereas it showed positive correlation with plant height (cm) (0.108), stem diameter (cm) (0.239), number of branches per plant (0.257), panicle length (cm) (0.237), panicle breadth (cm) 0.321, leaf length (cm) (0.322), fresh weight of shoot per plant (g) (0.341), fresh weight of root per plant (g) (0.268), leaf stem ratio (0.304), dry weight of root and shoot (g) (0.296) and test weight (0.097).

Table 1: Genetic parameters of variability for yield and its component traits in Amaranthus genotypes

S. No.	Characters	Grand Mean	Range		Coefficient of variations		Heritability% (BS)	Genetic Advance	GA as% of mean
			Min.	Max.	Phenotypic	Genotypic			
1	Plant height (cm)	82.63	53.70	110.50	22.82	22.65	0.99	38.27	46.31
2	Stem Diameter (cm)	3.44	2.17	5.27	31.78	30.75	0.94	2.11	61.30
3	Number of Branches per plant	7.24	4.50	11.30	33.94	33.57	0.98	4.95	68.39
4	Number of leaves per plant	45.97	31.00	72.33	35.25	30.40	0.74	24.82	54.00
5	Number of inflorescences per plant	17.67	11.33	23.33	22.00	19.45	0.78	6.26	35.43
6	Days to initiation of first inflorescence	49.03	44.00	51.67	5.89	5.37	0.83	4.94	10.07
7	Days to initiation of 50% Flowering	60.94	56.67	64.33	5.81	4.36	0.57	4.12	6.76
8	Panicle length (cm)	26.27	21.00	33.67	17.33	16.06	0.86	8.05	30.65
9	Panicle breadth (cm)	3.74	2.29	5.03	78.86	47.92	0.07	1.41	26.45
10	Leaf length (cm)	12.27	9.00	15.17	21.36	20.99	0.97	5.21	42.48
11	Leaf width (cm)	7.56	5.17	9.80	22.67	22.17	0.96	3.38	44.68
12	Fresh weight of shoot per plant (g)	90.68	60.10	132.80	26.49	26.36	0.99	49.00	54.04
13	Fresh weight of root per plant (g)	13.47	10.93	15.57	15.70	14.51	0.85	3.72	27.62
14	Fresh weight of leaf (g)	56.95	31.50	115.08	45.88	45.14	0.97	52.10	91.48
15	Leaf Stem Ratio	0.81	0.54	1.23	29.39	20.74	0.50	0.24	30.14
16	Dry weight of shoot& root (g)	18.92	14.07	24.92	22.01	21.01	0.91	7.82	41.31
17	Leaf Area (cm ²)	13.01	8.84	18.98	28.25	27.10	0.92	6.96	53.53
18	Test Weight (g)	0.87	0.71	1.05	12.88	12.68	0.97	0.22	25.70
19	Seed yield per plant (g)	2.43	1.14	3.47	32.07	31.59	0.97	1.56	64.11
20	Leaf yield per plant (g)	67.79	41.50	115.08	38.88	38.58	0.98	53.45	78.85
21	Seed yield per ha (q)	2.70	1.26	3.84	32.15	31.67	0.97	1.74	64.25
22	Leaf yield per ha (q)	75.03	45.92	127.34	38.86	38.56	0.99	59.14	78.82
23	Harvest Index (%)	45.55	31.00	59.00	18.18	17.28	0.90	15.42	33.85

Table 2a: Correlation coefficient analysis for yield and its related traits in Amaranthus genotypes

Traits	Stem diameter (cm)	Number of branches per plant	Number of leaves per plant	Number of inflorescence per plant	Days to initiation of first inflorescence	Days to initiation to 50% flowering	Panicle length (cm)	Panicle breadth (cm)	Leaf length (cm)	Leaf width (cm)	Fresh weight of shoot (g)
Plant height (cm)	0.953 **	0.946 **	0.206	0.164	-0.554 **	-0.566 **	0.7991 **	0.3517 *	0.8285 **	0.8031 **	0.739 **
Stem Diameter (cm)		0.959 **	0.258	0.224	-0.602 **	-0.609 **	0.768 **	0.415 *	0.803 **	0.841 **	0.713 **
Number of Branches per plant			0.226	0.181	-0.639 **	-0.639 **	0.736 **	0.369 *	0.789 **	0.796 **	0.746 **
Number of leaves per plant				0.603 **	-0.388 *	-0.155	0.336	0.305	0.385 *	0.486 **	0.541*
Number of inflorescences per plant					-0.075	0.071	0.436 *	0.152	0.489 **	0.545 **	0.228
Days to initiation of first inflorescence						0.815 **	-0.258	-0.251	-0.426 *	-0.523 **	-0.729 **
Days to initiation of 50% Flowering							-0.239	-0.227	-0.36 *	-0.416 *	-0.576 **
Panicle length (cm)								0.3159	0.7902 **	0.7753 **	0.5529 **
Panicle breadth (cm)									0.2209	0.3227	0.3269
Leaf length (cm)										0.9276 **	0.703 **
Leaf width (cm)											0.6528 **
Fresh weight of shoot per plant (g)											
Fresh weight of root per plant (g)											
Fresh weight of leaf (g)											
Leaf Stem Ratio											
Dry weight of shoot& root (g)											
Leaf Area (cm ²)											
Harvest Index (%)											
Test Weight (g)											
Seed yield per plant (g)											
Leaf yield per plant (g)											
Seed yield per ha (q)											

Significant at 5%, ** Significant at 1%

Table 2b: Correlation coefficient analysis for yield and its related traits in Amaranthus genotypes

Traits	Fresh weight of root (g)	Fresh weight of leaf (g)	Leaf stem ratio	Dry weight of root and shoot (g)	Leaf area (cm ²)	Harvest Index (%)	Test weight (g)	Seed yield per plant (g)	Leaf yield per plant (g)	Seed yield per ha (q)	Leaf yield per ha (q)
Plant height (cm)	-0.080	-0.055	-0.339	-0.226	-0.041	0.1268	0.459 **	0.559 **	0.107	0.560**	0.108
Stem Diameter (cm)	0.0004	0.082	-0.189	-0.114	0.064	0.298	0.440 *	0.664 **	0.239	0.661**	0.239
Number of Branches per plant	0.006	0.098	-0.189	-0.084	0.085	0.293	0.366 *	0.654 **	0.257	0.647**	0.257
Number of leaves per plant	0.227	0.523 **	0.013	0.200	0.702 **	0.446 *	0.084	0.499 **	0.636 **	0.497 **	0.637**
Number of inflorescences per plant	0.369 *	0.535 **	0.154	0.338	0.348 *	0.556 **	0.238	0.665 **	0.618 **	0.666**	0.617**
Days to initiation of first inflorescence	-0.326	-0.135	0.011	-0.278	-0.422 *	-0.429 *	0.071	-0.434 *	-0.242	-0.422 *	-0.243
Days to initiation of 50% Flowering	-0.224	0.008	0.134	-0.075	-0.169	-0.292	-0.123	-0.291	-0.110	-0.283	-0.111
Panicle length (cm)	-0.178	0.082	-0.267	-0.217	0.004	0.194	0.509 **	0.587 **	0.237	0.598 **	0.237
Panicle breadth (cm)	-0.011	0.1713	-0.284	0.020	0.267	0.256	0.281	0.228	0.320	0.228	0.321
Leaf length (cm)	0.199	0.216	-0.051	0.118	0.12	0.272	0.255	0.809**	0.322	0.813 **	0.322
Leaf width (cm)	0.211	0.253	0.017	0.147	0.209	0.449*	0.312	0.871 **	0.367 *	0.878 **	0.368*
Fresh weight of shoot per plant (g)	0.203	0.162	-0.299	0.168	0.409 *	0.213	-0.016	0.508 **	0.341	0.495 **	0.341
Fresh weight of root per plant (g)		0.264	0.287	0.859 **	0.237	0.294	0.552 **	0.340	0.267	0.334	0.268
Fresh weight of leaf (g)			0.474 **	0.325	0.796 **	0.705 **	0.011	0.626 **	0.953 **	0.691 **	0.953**
Leaf Stem Ratio				0.423 *	0.284	0.477 **	-0.225	0.329	0.304	0.321	0.304
Dry weight of shoot & root (g)					0.335	0.368 *	0.699 **	0.322	0.295	0.311	0.296
Leaf Area (cm ²)						0.624**	-0.155	0.434 *	0.811 **	0.426 *	0.811**
Harvest Index (%)							0.064	0.699 **	0.750 **	0.694 **	0.751**
Test Weight (g)								0.171	0.096	0.194	0.097
Seed yield per plant (g)									0.669 **	0.997**	0.670 **
Leaf yield per plant (g)										0.658 **	1.000 **
Seed yield per ha (q)											0.659 **

Significant at 5%, ** Significant at 1%

Appendices Ia: Mean performance of eleven Amaranthus genotypes

S. No.	Genotypes	Plant height (cm)	Stem diameter (cm)	Number of branches per plant	Number of leaves per plant	Number of inflorescences per plant	Days to initiation of first inflorescence	Days to initiation of 50% flowering	Panicle length (cm)	Panicle breadth (cm)	Leaf length (cm)	Leaf width (cm)	Fresh weight of root per plant (g)	Fresh weight of shoot per plant (g)
1	<i>Amaranthus viridis</i>	68.11	2.6	5.5	36.33	11.33	49.67	61	24	3.7	7.93	5.17	11	71.37
2	<i>Amaranthus cruentus</i>	75.1	2.83	5.8	37.67	13.33	49	60.33	21	3.33	9	5.5	10.97	81.37
3	SHIVPURIAMARANTHUS17-18-119	91.6	3.83	7.17	48.67	21.67	51	62.67	31.33	5.03	14.37	9.43	11.83	73.2
4	NEEMUCHAMA-17-18-113	110.5	5.27	11.3	72.33	23.33	45.33	56.67	33.67	2.29	15.2	9.8	13.5	132.8
5	MORENAAMA17-18-110	100.4	4.5	9.67	46	16.67	48	58	26.67	3.8	13.9	8.73	15	95.067
6	KERELAAMA17-18-102	71.57	2.63	5.23	74	19.67	48.33	62.33	24.33	3.23	12.87	7.7	15.57	114.73
7	INDOREAMA17-18-133	53.7	2.17	4.63	47.33	20.33	51.33	64.33	22.33	3.27	10.13	6.27	13.43	60.1
8	SEHOREAMA17-18-122	93.5	3.67	8.03	31	16	53	65	30.67	3.47	13.93	7.37	10.93	92.97
9	INDOREAMA 17-18-104	102.97	4.83	10.83	44.67	17	44	57	29.33	3.23	15.17	9.8	14.27	117.43
10	ARKA SUGUNA	58.37	2.23	4.5	35.33	19.33	51.67	64	21.67	3.27	9.87	6.3	16.3	60.83
11	ARUNRED02-047-11-TLR-19-07	83.17	3.27	6.93	32.33	15.67	48	59	24	3.23	12.6	7.03	15.33	97.57
	Mean	82.63	3.44	7.23	45.97	17.67	49.03	60.94	26.27	3.74	12.27	7.55	13.47	90.68
	SE (m) ±	1.32	0.16	0.21	6.7	1.05	0.69	1.35	0.99	0.11	0.28	0.21	0.47	1.36
	CD at 5%	3.90363	0.45	0.62	13.97	3.1	2.02	3.97	2.92	0.33	0.83	0.61	1.37	4.01
	CV (%)	2.77363	8.01	5.02	17.84	10.3	2.42	3.82	6.51	5.25	3.97	4.73	6	2.6

Appendices Ib: Mean performance of eleven Amaranthus genotypes

S. No.	Genotypes	Fresh weight of leaf (g)	Leaf stem ratio	Dry weight of shoot & root (g)	Leaf Area (cm ²)	Seed yield per plant (g)	Leaf yield per plant (g)	Seed yield per plot (kg)	Leaf yield per plot (kg)	Seed yield per ha (q)	Leaf yield per ha (q)	Harvest Index (%)	Test weight (g)
1	<i>Amaranthus viridis</i>	31.5	0.69	14.6	11.58	1.14	41.5	63.84	2.32	1.26	45.92	0.4	0.83
2	<i>Amaranthus cruentus</i>	34.21	0.64	14.07	12.24	1.31	44.21	73.55	2.48	1.46	49.01	0.38	0.96
3	SHIVPURIAMARANTHUS17-18-119	42.85	0.83	14.9	9.92	2.91	52.84	162.77	2.96	3.31	58.5	0.48	1.05
4	NEEMUCHAMA-17-18-113	80.26	0.61	18.7	16.88	3.29	109.47	184.05	6.13	3.64	121.15	0.55	1.02
5	MORENAAMA17-18-110	69.4	0.84	17.47	12.96	3.04	79.4	170.24	4.45	3.36	87.88	0.47	0.93
6	KERELAAMA17-18-102	75.5	0.78	23.17	18.98	2.51	85.5	140.75	4.79	2.78	94.59	0.44	0.71
7	INDOREAMA17-18-133	115.08	1.23	20.94	17.86	2.89	115.08	161.65	6.44	3.19	127.34	0.59	0.86
8	SEHOREAMA17-18-122	44.26	0.54	14.56	8.84	2.2	54.26	123.39	3.04	2.44	60.01	0.31	0.91
9	INDOREAMA 17-18-104	57.82	0.99	23.17	14.44	3.47	67.82	194.32	3.8	3.84	75.1	0.53	0.77
10	ARKA SUGUNA	38.97	0.89	24.92	9.4	1.9	48.97	106.21	2.74	2.1	54.22	0.4	0.77
11	ARUNRED02-047-11-TLR-19-07	36.65	0.83	21.63	10	2.12	46.65	118.72	2.61	2.35	51.65	0.44	0.77
	Mean	56.95	0.81	18.92	13.01	2.43	67.79	136.32	3.8	2.7	75.03	0.46	0.87
	SE (m) ±	2.7	0.1	0.72	0.6	0.08	1.9	4.33	0.11	0.09	2.09	0.01	0.01
	CD at 5%	7.97	0.29	2.11	1.77	0.23	5.61	12.78	0.31	0.26	6.18	0.04	0.03
	CV (%)	8.22	20.82	6.56	8	5.5	4.86	5.5	4.83	5.56	4.83	5.63	2.29

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