Variability in Nutmeg (*Myristica fragrans* Houtt.) under High Rainfall and High Altitude Kodagu Region of Karnataka

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The vegetative, fruit, seed and mace characters of 23 accessions of nutmeg (*Myristica fragrans* Houtt.) were studied for variability at Indian Institute of Spices Research, Cardamom Research Centre, Appangala, Karnataka. Accessions exhibited wide range of variability for different characters studied. Maximum variability was recorded for fresh seed yield per tree and minimum variability was recorded for the leaf and seed characters. Medium to high variability was recorded for mace characters. Among the 23 accessions studied, the maximum fresh seed weight (16.5 g) was recorded in IC548880, the other promising accessions for different economic characters were IC548896 for dry seed weight (10 g/fruit), IC548921 for dry seed yield (9.2 kg/tree), IC548892 for dry mace weight of a fruit (2.1 g/fruit) and IC548928 for dry mace weight of a tree (1,045g/tree).

Key Words: Fruit, Mace, *Myristica fragrans*, Nutmeg, Variability

Introduction

Nutmeg (*Myristica fragrans* Houtt.) (Family: Myristicaceae) is believed to be native of Bonda Islands of Eastern Indonesia, formerly called the 'Spice Islands'. In India, it is mainly cultivated in South India particularly in certain pockets of Kerala, Tamil Nadu and Karnataka, which was originally introduced by the British during the 18th century (Krishnamoorthy *et al*., 2001). The name '*Myristica*' is derived from the Greek word 'Myron', a sweet liquid distilled from the plant (Everett, 1981). It is a dioecious or monoecious tree. Being an obligatory cross pollinated crop, wide natural variability is observed in nutmeg with respect to vegetative and reproductive characters (NRCS, 1989). The present investigation was therefore undertaken to study the existing variability under high rainfall, high altitude, region of Kodagu, (Karnataka) with an aim to estimate the variability for various morphological, fruit and mace characters.

Materials and Methods

The study was conducted in 2006-07 crop season on 25 year old seedling progenies of nutmeg trees planted as mixed crop in cardamom plantation at the Cardamom Research Centre, Appangala, which is located 12º26'N latitude and 75º45'E longitude at an altitude of 1000 MSL. It falls under cool humid and high rainfall zone with 2500-3500mm rainfall per annum. Twenty-three nutmeg accessions, *viz*., (IC548880, IC548881, IC548892, IC548896, IC548909, IC548913, IC548917, IC548919, IC548920, IC548921, IC548922, IC548926, IC548928, IC548929, IC548930, IC548936, IC548937, IC548940, IC548941, IC548944, IC548945, IC548947 and IC548948) constituted the experimental material. Observations were recorded on various characters, *viz*., tree girth (cm), leaf length (cm), leaf breadth (cm), petiole length (cm), fruit length (cm), fruit width (cm), single fruit weight (g); fresh fruit yield (kg/tree), number of fruits/tree, pericarp thickness (cm), pericarp fresh weight (g), pericarp dry weight (g), seed length (cm), seed width (cm), fresh seed weight (g), dry seed weight (g), fresh seed yield (kg/tree), dry seed yield (kg/tree), mace thickness (cm), fresh mace weight (g), dry mace weight (g), fresh mace yield (g/tree) and dry mace yield (g/tree) were recorded in the season. The data was statistically analyzed for range, mean and co-efficient of variation between genotypes (Panse and Sukhatme, 1995).

Results and Discussion

The data on range, mean, standard deviation and coefficient of variations and three best genotypes for each character are presented in Table 1. Wide range of variation was observed between genotypes for fresh seed yield (kg/tree), dry seed yield (kg/tree), fresh mace yield (g/tree) and dry mace yield (g/tree). The fresh fruit yield (kg/tree) ranged from 0.79 to 88.24 kg/tree with mean of 25.79 kg/tree and coefficient of variation was 107.11 per cent. Accession IC548920 recorded maximum fresh weight (88.24 kg/tree). Fresh seed yield (kg/tree) ranged from 0.09 to 20.07 kg per tree with a mean of 4.33 kg per tree and coefficient of variation was 117.16 per

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Table 1.

Characters	Range	Mean	SD	CV (%)	Promising accessions
Tree girth (cm)	29-72	54.58	10.93	20.03	IC548928, IC548937, IC548917
Leaf length (cm)	11.70-15.68	13.27	1.08	8.10	IC548892, IC548913, IC548926
Leaf breadth (cm)	4.62-6.72	5.59	0.60	10.76	IC548913, IC548892, IC548909
Petiole length (cm)	0.98-1.36	1.11	0.09	7.85	IC548892, IC548981, IC548896
Fruit length (cm)	4.28-7.70	5.95	0.63	10.65	IC548896, IC548909, IC548944
Fruit width (cm)	3.72-6.94	5.07	0.57	11.31	IC548896, IC548920, IC548922
Single fruit weight (g)	34.10-144.80	64.26	20.66	32.15	IC548896, IC548922, IC548945
Fresh fruit yield/tree (kg)	0.79-88.24	25.79	27.63	107.11	IC548920, IC548921, IC548928
No. of fruits/tree	12-1759	488.52	507.76	103.94	IC548921, IC548928, IC548920
Pericarp thickness (cm)	1.10-2.20	1.39	0.27	19.29	IC548896, IC548929, IC548919
Pericarp fresh weight (g)	28.40-146.40	52.34	22.01	42.05	IC548896, IC548945, IC548921
Pericarp dry weight (g)	3.18-12.80	6.65	2.42	36.38	IC548880, IC548945, IC548892
Seed length (cm)	2.28-3.60	2.92	0.29	10.08	IC548896, IC548880, IC548920
Seed width (cm)	1.96-3.70	2.47	0.46	18.60	IC548880, IC548921, IC548896
Fresh seed weight (g)	5.40-16.50	8.72	2.68	30.78	IC548880, IC548896, IC548921
Dry seed weight (g)	2.50-10.00	4.50	2.05	45.49	IC548896, IC548880, IC548945
Seed fresh weight/tree (kg)	0.09-20.07	4.33	5.07	117.16	IC548921, IC548920, IC548928
Seed dry weight/tree (kg)	0.06-9.23	2.06	2.39	115.90	IC548921, IC548920, IC548928
Mace thickness (cm)	0.10-0.20	0.14	0.03	22.89	IC548892, IC548940, IC548881
Fresh mace weight (g)	0.50-5.40	2.04	1.00	49.15	IC548892, IC548922, IC548909
Dry mace weight (g)	0.20-2.10	0.71	0.43	61.03	IC548892, IC548940, IC548909
Mace fresh weight/tree (g)	30-4239	1049.8	1226.36	116.82	IC548921, IC548922, IC548928
Mace dry weight/tree (g)	5.60-1045.00	260.18	296.56	113.98	IC548928, IC548920, IC548921

cent. Accession IC5448921 recorded maximum fresh seed yield per tree. Dry seed yield ranged from 0.06 to 9.23 kg per tree with a mean of 2.06 kg per tree with coefficient of variation of 115.9 per cent. Accession IC548921 recorded maximum seed dry weight. Fresh mace yield ranged from 30 to 4,239 g per tree with a mean of 126.36 g per tree with 116.8 per cent coefficient of variation. Dry mace yield ranged from 5.6 to 1,045 g per tree with coefficient variation 113.98. Accession IC548928 recorded maximum mace dry weight.

Medium variability was recorded for single fruit weight (g), fresh pericarp weight (g/fruit), dry pericarp weight (g/fruit), fresh seed weight (g/seed), dry seed weight (g/seed), fresh mace weight (g/fruit), dry mace weight (g/fruit).

Single fruit weight ranged from 34.1 to 144.8 g with a mean of 64.26 g per fruit and coefficient of variation 32.15 per cent (Fig. 1). Accession IC548896 recorded maximum single fruit weight (144.8 g per fruit). Number of fruits per tree ranged from 12 to 1,759 with 103.94 per cent coefficient of variation. Pericarp fresh weight ranged from 28.4 to 146.4 with a mean of 52.34 g per fruit and coefficient of variation was 42.05 per cent. Accession IC548896 recorded maximum pulp fresh weight of 146.4 g per fruit. Pericarp dry weight ranged from 3.18 to 12.8 g with a mean of 6.65 g per fruit with coefficient of variation 36.38 per cent. Accession IC548880 recorded maximum dry pericarp weight. Fresh seed weight ranged from 5.4 to 16.5 g with a mean of 8.72 g and coefficient of variation was 30.78 per cent (Fig. 2). Accession IC548880 recorded maximum fresh seed weight (Fig. 3). Dry weight of seed ranged from 2.5 to 10 g per seed with a mean of 4.5 g per seed and coefficient of variation was 45.49 per cent.

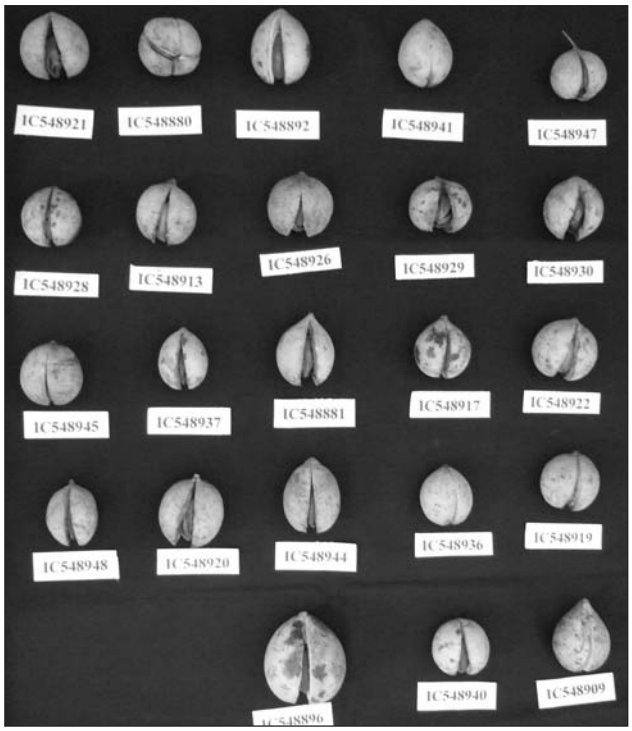

Fig. 1: Variability in nutmeg fruits

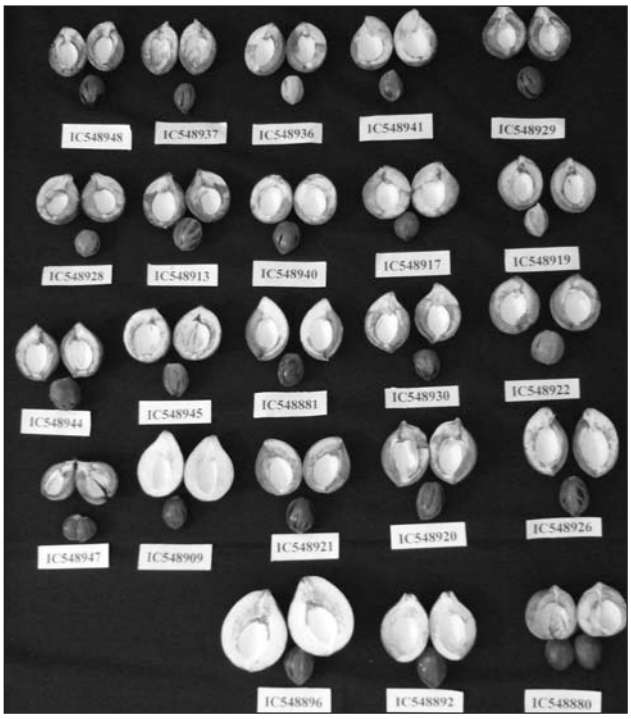

Fig. 2: Variability in nutmeg seeds

Accession IC548896 recorded maximum seed dry weight. Fresh mace weight ranged from 0.5 to 5.4 with a mean of 2.04 g per fruit and coefficient of variation was 49.15 percent. Accession IC548892 recorded maximum fresh mace weight of 5.4 g per fruit. Dry mace weight ranged from 0.2 to 2.1 with a mean of 0.71 g of mace per fruit and coefficient of variation was 61.03 per cent. Accession IC548892 recorded maximum dry mace weight of 2.1 g of mace per fruit.

Low level of coefficient of variation was recorded for tree girth, leaf length, leaf breadth, fruit length, fruit width, pulp thickness, seed length, seed width and mace thickness. Tree girth ranged from 29 to 72 cm with a mean of 54.58 cm and coefficient of variation was 20.03 per cent. Accession IC548928 recorded maximum tree girth of 72 cm. Leaf length, leaf width, petiole length and fruit width recorded low variability. Seed width ranged from 1.96 to 3.7 cm with a mean of 2.47

Fig. 4: Twin seeds

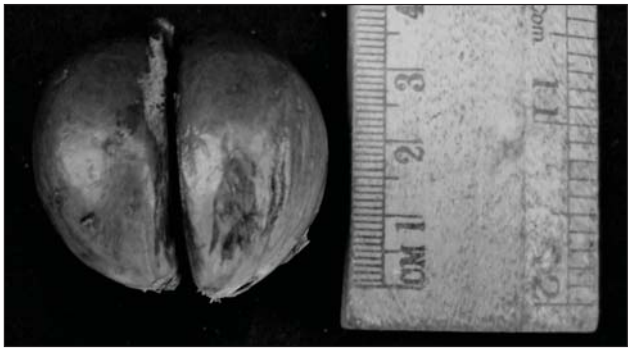

Fig. 3: IC548880–Maximum dry pericarp and fresh seed weight

cm and coefficient of variation was 18.6 per cent. Accession IC548880 recorded maximum seed width of 3.7 cm. Mace thickness ranged from 0.1 to 0.2 with a mean of 0.14 cm and coefficient of variation was 22.89 per cent. Accession IC548892 recorded maximum mace thickness.

Accession IC548896 recorded higher dry seed weight, seed length, single fruit weight, fruit width, seed length, single fruit weight, fruit width, fruit length, and IC548921 recorded higher fresh seed yield, dry seed yield (kg/tree) and fresh mace yield of 4,239 g per tree. The dry seed weight (kg/tree) is comparable to released verities (Nirmal Babu *et al.*, 2001).

Few accessions recorded special characters like twin seeds (Fig. 4), low pulp to seed ratio, triangular seed shape, deep red colour aril, rose colour aril, high pulp seed ratio are presented in Table 2.

All these accessions were conserved in cardamom cropping system under the regulated shade of higher forest tree canopy. Shade regulation of bigger shade trees will further enhance yield per tree and quality and weight of seed and mace. The superior genotypes, which are suitable, can be used for developing genotypes for cultivation as mono or mixed crop in cardamom, coffee or tea estates or under homestead cultivation.

Table 2. Qualitative characters recorded in different genotypes

Characters	Genotypes
Deep red aril	IC548892, IC548896, IC548929, IC548936
Rose colour aril	IC548920
Dark black seed	IC548936
Bold seed	IC548896
Elongated (triangular) seed	IC548936
Twin seeds	IC548880, IC548921, IC548924, IC548947, IC548948

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