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Comparative Yield Analysis of Black Pepper (Piper Nigrum L.) Genotypes of Uttara Kannada District, Karnataka

Sudheesh Kulkarni
getsudheesh.hort@gmail.com
University of Horticultural Sciences, Bagalkot

N K Hegde
nkhegde@yahoo.com
University of Horticultural Sciences, Bagalkot

Laxminarayan Hegde
sudheesh28@rediffmail.com
University of Horticultural Sciences, Bagalkot

Vijayakumar Narayanpur
kulkarni_hort@yahoo.com
University of Horticultural Sciences, Bagalkot

Mukesh Chavan
sudheesh.kulkarni@gmail.com
University of Horticultural Sciences, Bagalkot

Sadananda G K
gk.sadananda@gmail.com
University of Horticultural Sciences, Bagalkot

Prashantha A
sudheesh.kulkarni@sify.com
University of Horticultural Sciences, Bagalkot

Mahantesh Naika
sudheesh.kulkarni@orkut.com
University of Horticultural Sciences, Bagalkot

ABSTRACT

Indian black pepper fetches a premium price in major international spices markets because of its intrinsic quality. But the continuous use of low yielding cultivars, non-availability of planting materials, losses due to biotic and abiotic stresses and also non adoption of appropriate agronomic practices are some of the prominent factors contributing to lower productivity of black pepper in India. There is no reliable information on the availability of improved local genotypes of Uttara Kannada district for the arecanut based mixed system of cultivation in Karnataka. However, some of the superior genotypes are believed to be high yielders with superior quality and tolerant to drought situation, pest and diseases, that may be available in the farmers fields. In this connection present experiment conducted at Uttara Kannada district of Karnataka using 52 genotypes. Among the genotypes, green pepper yield per vine was the highest in Panniyur 1 and was on par with the genotypes viz., SV 11, SV 7 and Kudure Bala. Whereas, maximum dry pepper yield per vine was recorded by the genotype SV 11 and was on par with genotype Kudure Bala, national check var. Panniyur 1 and SV 7. However, the highest recovery of black pepper was observed in farmer variety Sigandini (37.74 %) and was at par with the genotypes Magod Jaddi, Kudure bala, SV 11, Sambar Dadiga, Kari Dadiga, Havali Special and Kurimale compared to national var. Panniyur 1.

KEYWORDS: *Black Pepper, Yield, Genotypes, Karnataka*

1. Introduction

Black pepper (*Piper nigrum* L) often described as black gold is known as King of spices in the world spice market. Black pepper is cultivated in more than 26 countries globally including India, Indonesia, Malaysia, Vietnam, Sri Lanka and China. It is a native spice of India due to its origin in the Western Ghats, is one of the major export oriented and revenue generating spices for India. The uses of black pepper are increasing steadily in various fields such as food processing and pharmaceutical industry due to its acceptance as source of natural antioxidant having anti-carcinogenic activity.

The properties other than spices include bioavailability enhancement, carminative property, anti-inflammatory action, cholesterol lowering capacity, immune enhancing ability, antipyretic, antimicrobial and rubefacient activity.
Domestication of black pepper started hundreds of years back. Cultivar diversity is one of the principal components of diversity in pepper. About 70 cultivars have been evolved in Kerala by the process of selection and rejection by man over the years from the wild and they differ greatly in morphological characters and yield potential (Mathai *et al.,* 1981; Ibrahim *et al.,* 1985). Most of the Indian cultivars, numbering about 100, are land races that evolved naturally and are further selected by man. Advanced cultivars have been derived mostly by clonal selections though a few are of hybrid and open pollinated background (Krishnamoorthy and Parthasarathy, 2010).

Indian black pepper fetches a premium price in major international spices markets because of its intrinsic quality. But the continuous use of low yielding cultivars, non-availability of planting materials, losses due to biotic and abiotic stresses and also non adoption of appropriate agronomic practices are some of the prominent factors contributing to lower productivity of black pepper in India. There is no reliable information on the availability of improved local genotypes of Uttara Kannada district for the arecanut based mixed system of cultivation in Karnataka. However, some of the superior genotypes are believed to be high yielders with superior quality and tolerant to drought situation, pest and diseases, that may be available in the farmers fields. In this connection, the present study was conducted with an objective to identify the suitable genotype of black pepper for yield under arecanut based cropping system.

2. Material and methods

The experiment was conducted in randomised block design for the two seasons.
No. of genotypes: 52 (Treatments)
System of cultivation: Mixed crop with Arecanut
Location: Hilly zone of Karnataka
Year/ season: 2020-21 & 2021-22
Age: Stable yielding vines (6 – 7 years)
Design: Randomised Block Design
Replication: 2
Check varieties: *Var*. Panniyur 1 and farmer variety Sigandini

2.1 Green pepper yield

Fresh yield of berries was recorded by taking total yield of berries from different harvests and expressed as fresh berry yield per vine in kilograms.

2.2 Dry pepper yield

The harvested fresh berries are dried from each vine and expressed as dry berry yield per vine in kilograms.

2.3 Dry recovery

The harvested fresh berries of one kilogram were dried and the final weight of the dried berries was measured and recovery was expressed in percentage using formula

$$\text{Black pepper recovery (\%)} = \frac{\text{Weight of dry berries (g)}}{\text{Weight of fresh berries (g)}} \times 100$$

3. Result and discussion

3.1 Green pepper yield per vine

The present study revealed that maximum green pepper yield per vine was found in the national check Panniyur 1 (12.25 kg) and was on par with the genotypes SV 11 (12.02 kg), SV 7 and Kudure Bala (11.74 kg each) compared to local check Sigandini (10.42 kg). The parameters like percentage of hermaphrodite flowers, number of spikes in lateral branch, number of spikes per vine, spike weight, number of berries per spike, bisexual flowers, berry setting percentage, fresh weight of 100 berries and volume of 100 berries are important factor for higher yield. While, genotype SV 16 (2.96 kg) recorded lowest green pepper yield among the genotypes. Similar results were reported by Bhagavantagoudra *et al.* (2008) where they recorded 19.06 kg per vine as the highest green pepper yield in the var. Panniyur-3.

It was reported that 12.8 kg per vine as maximum fresh yield in black pepper var. Panniyur-3 (Anon., 2009). Kurian *et al*. (2002) recorded 906.5 g per vine as highest fresh yield. Sasikumar *et al.* (2004) in one of their studies recorded IISR-Malabar Excel had highest fresh berry yield (2.06 kg/vine). Kandiannan *et al.* (2007) recorded 5.23 kg per vine of fresh weight. Fresh berry yield per vine was significantly higher in var. Panniyur-1 (9.60 kg) followed by Sirsi-1 (8.95 kg) while it was the lowest in cv. Malligesara (5.95 kg) (Naik *et al.,* 2013). Among the nine accessions of blackpepper evaluated, fresh weight of berries per vine was highest in Panniyur-1 (645 g) (Anon., 2015). Var. Panniyur-1 recorded 22.84 kg per vine and had the highest fresh weight of berries in black pepper (Hussain *et al*., 2017); 10.67 kg per vine in var. Panniyur-1 was recorded as highest fresh weight of berries according to Pannaga (2021).

3.2 Dry pepper yield

Dry pepper yield varied significantly among the 52 genotypes. Maximum dry pepper yield per vine was recorded in the genotype SV 11 (4.24 kg) and it is on par with genotype Kudure Bala (4.15 kg), national check var. Panniyur 1 (4.13 kg) and SV 7 (4.10 kg) compared to local check Sigandini (3.93 kg). Minimum dry pepper yield was recorded in genotype SV 16 (0.91 kg). Bhagavantagoudra *et al.* (2008) recorded 5.81 kg per vine as highest dry yield of berries in var. Panniyur-3 of black pepper followed by 5.28 kg per vine in var. Panniyur-5 and as lowest yield was recorded in cv. Karimunda (3.17 kgvine^{-1}). Maximum dry berry yield was recorded in cv. Selection-2 (2.15 kgvine^{-1}), which was on par with var. Panniyur-1 (1.70 kg/vine), HP 105 (1.65 kgvine^{-1}) and HP 34 (1.42 kgvine^{-1}) (Anon., 2014). Arya *et al.* (2004) recorded higher dry yield of pepper in var. Panniyur-6 (2.13 kgvine^{-1}) and 1.41 kgvine^{-1} in var. Panniyur-7. It was reported that dry berry yield was highest in cv. Vallanamban (2.70 kgvine^{-1}) and the lowest was observed in cv. Neelamundi (2.37 kgvine^{-1}) (Anon., 2009). Maheswarappa *et al.* (2012) recorded that the var. IISR-Thevam had higher dry berry yield (1.81 kgvine^{-1}) followed by var. Panniyur-5 (1.12 kgvine^{-1}) under coconut garden. In one of the studies, Accession No. 53 had maximum dry berry yield of 1.58 kg per vine at Pechiparai (Anon., 2014).

This might be mainly due to maximum fresh berry yield per vine and comparatively higher recovery of black pepper apart from spike and berry characters. Tripathi *et al.* (2018) and Arya *et al.* (2004) stated that there will be yield difference between any cultivars or varieties due to variation in spike and berry characters. However, in contrary to this, the variety Panniyur-1 recorded higher dry yield (1.27 kgvine^{-1}) followed by Cul. 5308 (1.18 kgvine^{-1}) and the lowest was observed in Cul. 1411 (0.13 kgvine^{-1}) (Anon., 2009). Naik *et al.* (2013) reported that, dry berry yield per vine was significantly higher in var. Panniyur-1 (2.58 kg) which was on par with cv. Sirsi-1 (2.24 kg) and Ademane pepper (2.21 kg) whereas, it was the lowest in cv. Malligesara (1.54 kg). Panniyur-1 recorded the maximum dry berry yield (1.70 kg/vine) followed by HP 1411 and HP 34 (1.57 kg and 1.27 kg, respectively) (Anon., 2014). Krishnamurthy *et al.* (2010) observed that the var. Panniyur-1, Sreekara and Subhakara gave 2.5 to 3.0 kg per vine of dry berries from fifth year onwards. According to Hussain *et al.* (2017) and Pannaga (2021) maximum dry yield in Panniyur-1 variety of black pepper was 8.22 kg/vine and 3.66 kg/vine, respectively. Arpitha (2023) reported maximum dry yield per vine in Neelamundi (2.21 kg) and minimum dry yield in V-5 (0.83 kg). According to Divya (2023) the maximum dry yield per plant in cv. Kudure Bala (4.67 kg) and minimum in cv. Kalyani (1.65 kg).

3.3 Dry recovery

An ultimate selection of the black pepper is determined on dry recovery. Depending on moisture and endosperm contents each genotype will have its own recovery. In the present study, maximum recovery of black pepper was observed in local cv. Sigandini (37.74 %) and was at par with the genotypes Magod Jaddi collection (35.44 %), Kudure Bala (35.34 %), SV 11 (35.27 %), Sambar Dadiga (34.89 %), Kari Dadiga (34.82 %), Havali Special (34.50 %) and Kurimale (34.40 %) compared to national check var. Panniyur 1 (34.17 %). This is due to higher dry matter accumulation in the genotypes and also starch content in the berries. While the minimum recovery of black pepper was recorded in genotype Huchchu Menasu (30.21 %). The per cent recovery may vary with different cultivars, presence of starch, moisture content and maturity of the berries. Prasannakumari *et al.* (2001) reported cv. Neelamundi performed best with the highest recovery (35.70 %). Arya *et al.* (2004) recorded the high dry recovery in var. Panniyur- 7 (33.57 %) and minimum was in var. Panniyur-6 (32.93 %).

IISR-Thevam had the highest recovery (35 %) followed by var. IISR-Girimunda (34 %) and IISR-Malabar Excel (32 %) and the lowest in var. Panniyur-1 (30 %) in a study by Sasikumar *et al.* (2004). Hussain *et al.* (2017) recorded maximum black pepper recovery in SV 21 (39.61 %) whereas minimum was recorded in SV 20 (28.65 %). Tripathi *et al.* (2018) reported that the selection Arka Coorg Excel was having higher dry recovery (37.12 %). While, Naik *et al.* (2013) reported that the cv. Kudurugutta (31.30 %) recorded greater recovery of black pepper and it was on par with cv. Malligesara (30.82 %) and Uddakare (30.60 %) meanwhile, the lowest was found in Ademane pepper (28.08 %). Mohan Kumar (2018) observed maximum black pepper recovery in cv. Sigandini (39.16 %) and lowest in cv. Madana (27.81 %). Similar kinds of results are reported by Shivakumar *et al.,* (2020), Pannaga (2021), Arpitha (2023) and Divya (2023). The variations might be due to the genetic factors as well as the age of the vine, nutrition, maturity and location of the study.

4. Conclusion

Among the genotypes, green pepper yield per vine was the highest in Panniyur 1 and was on par with the genotypes viz., SV 11, SV 7 and Kudure Bala. Whereas, maximum dry pepper yield per vine was recorded by the genotype SV 11 and was on par with genotype Kudure Bala, national check var. Panniyur 1 and SV 7. However, the highest recovery of black pepper was observed in farmer variety Sigandini (37.74 %) and was at par with the genotypes Magod Jaddi, Kudure bala, SV 11, Sambar Dadiga, Kari Dadiga, Havali Special and Kurimale compared to national var. Panniyur 1.

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Table 1 : Green pepper yield in black pepper genotypes of Uttara Kannada District, Karnataka

Green pepper yield (kg/vine)							
Genotype	**2020-21**	**2021-22**	**Pooled**	**Genotype**	**2020-21**	**2021-22**	**Pooled**
G_1	8.01	8.76	8.39	G_{27}	8.24	7.98	8.11
G_2	6.38	7.26	6.82	G_{28}	5.45	6.07	5.76
G_3	9.89	10.06	9.98	G_{29}	6.06	5.79	5.93
G_4	8.01	7.64	7.83	G_{30}	11.87	12.01	11.94
G_5	8.04	8.66	8.35	G_{31}	3.71	4.23	3.97
G_6	6.59	6.42	6.51	G_{32}	8.64	8.79	8.72
G_7	8.19	7.93	8.06	G_{33}	8.81	8.23	8.52
G_8	7.94	8.53	8.24	G_{34}	12.07	11.97	12.02
G_9	6.67	6.91	6.79	G_{35}	7.78	6.98	7.38
G_{10}	7.88	8.63	8.26	G_{36}	7.27	7.01	7.14
G_{11}	5.28	5.79	5.54	G_{37}	8.61	7.83	8.22
G_{12}	5.38	6.03	5.71	G_{38}	5.44	6.02	5.73
G_{13}	4.68	5.36	5.02	G_{39}	2.75	3.17	2.96
G_{14}	7.91	8.53	8.22	G_{40}	9.77	9.13	9.45
G_{15}	7.61	8.43	8.02	G_{41}	8.47	7.98	8.23
G_{16}	7.03	6.89	6.96	G_{42}	7.63	7.28	7.46
G_{17}	6.78	7.02	6.90	G_{43}	11.23	10.89	11.06
G_{18}	11.41	12.06	11.74	G_{44}	7.62	7.41	7.52
G_{19}	9.61	10.69	10.15	G_{45}	8.04	8.73	8.39
G_{20}	10.18	10.49	10.34	G_{46}	8.94	10.29	9.62
G_{21}	5.51	6.16	5.84	G_{47}	5.71	6.66	6.19
G_{22}	10.71	11.29	11.00	G_{48}	7.12	6.93	7.03
G_{23}	10.28	11.53	10.91	G_{49}	8.84	9.18	9.01
G_{24}	6.78	7.36	7.07	G_{50}	7.54	8.19	7.87
G_{25}	8.33	8.19	8.26	G_{51}	10.11	10.73	10.42
G_{26}	7.52	8.01	7.77	G_{52}	12.00	12.50	12.25
		2020-21		**2021-22**		**Pooled**	
S. Em±		0.301		0.309		0.305	
C.D. at 5 %		0.853		0.879		0.866	
CV (%)		10.36		10.52		10.47	

G_1- Acc (BSH) 622; G_2 - Arshina Murta; G_3 - Basari Balli; G_4 - Bugadi Sara; G_5 – Dadiga; G_6 - Harthebail Gidda; G_7 - Harthebail Kare; G_8 - Havali Special; G_9 - Huchchu Menasu; G_{10} - Huklakai Special; G_{11} - Jeerige Munda; G_{12} - K. K. King; G_{13} – Kalyani; G_{14} - Kari Dadiga; G_{15} - Keregadde Mallisara; G_{16} - Kodamod Special; G_{17} - Kodnamane Special; G_{18} - Kudure Bala; G_{19} – Kuduru gutta; G_{20} - Kurimale; G_{21} - Magod Jaddi; G_{22} – Malabar; G_{23} - Master Kare; G_{24} - Nuchchu Menasu; G_{25} - SV 2; G_{26} - SV 3; G_{27} - SV 4; G_{28} - SV 5; G_{29} - SV 6; G_{30} - SV 7; G_{31} - SV 8; G_{32} - SV 9; G_{33} - SV 10; G_{34} - SV 11; G_{35} - SV 12; G_{36} - SV 13; G_{37} - SV 14; G_{38} - SV 15; G_{39} - SV 16; G_{40} - SV 17; G_{41} - SV 18; G_{42} - SV 19; G_{43} – SV 21; G_{44} - SV 22; G_{45} - Sambar Dadiga; G_{46} – Shamemane; G_{47} – Tattikai; G_{48} – Tattikudi; G_{49} - Tirupugare; G_{50} – Uddakare; G_{51} – Sigandini; G_{52} - Panniyur 1

Table 2 : Dry pepper yield in black pepper genotypes of Uttara Kannada District, Karnataka

Dry pepper yield (kg/vine)							
Genotype	**2020-21**	**2021-22**	**Pooled**	**Genotype**	**2020-21**	**2021-22**	**Pooled**
G_1	2.61	2.86	2.74	G_{27}	2.65	2.54	2.60
G_2	1.96	2.33	2.15	G_{28}	1.75	1.98	1.86
G_3	3.14	3.24	3.19	G_{29}	1.96	1.85	1.91
G_4	2.55	2.45	2.50	G_{30}	4.05	4.15	4.10
G_5	2.64	2.86	2.75	G_{31}	1.15	1.32	1.24
G_6	2.03	1.92	1.98	G_{32}	2.68	2.73	2.70
G_7	2.53	2.40	2.46	G_{33}	2.78	2.55	2.67
G_8	2.87	2.81	2.84	G_{34}	4.29	4.19	4.24
G_9	2.00	2.10	2.05	G_{35}	2.40	2.17	2.28
G_{10}	2.57	2.74	2.66	G_{36}	2.30	2.22	2.26
G_{11}	1.63	1.87	1.75	G_{37}	2.71	2.46	2.59
G_{12}	1.76	1.92	1.84	G_{38}	1.71	1.86	1.78
G_{13}	1.49	1.65	1.57	G_{39}	0.85	0.97	0.91
G_{14}	2.75	2.97	2.86	G_{40}	3.31	3.11	3.21
G_{15}	2.51	2.74	2.62	G_{41}	2.72	2.60	2.66
G_{16}	2.19	2.20	2.19	G_{42}	2.39	2.26	2.32
G_{17}	2.29	2.32	2.31	G_{43}	3.66	3.49	3.58
G_{18}	3.97	4.33	4.15	G_{44}	2.30	2.28	2.29
G_{19}	3.07	3.47	3.27	G_{45}	2.79	3.07	2.93
G_{20}	3.47	3.64	3.56	G_{46}	2.99	3.42	3.21
G_{21}	1.92	2.22	2.07	G_{47}	1.85	2.19	2.02
G_{22}	3.55	3.79	3.67	G_{48}	2.16	2.15	2.15
G_{23}	3.28	3.65	3.46	G_{49}	2.83	2.95	2.89
G_{24}	2.09	2.35	2.22	G_{50}	2.48	2.62	2.55
G_{25}	2.58	2.61	2.60	G_{51}	3.77	4.10	3.93
G_{26}	2.41	2.62	2.52	G_{52}	4.15	4.11	4.13
		2020-21		**2021-22**		**Pooled**	
S. Em±		0.373		0.102		0.103	
C.D. at 5 %		0.279		0.288		0.282	
CV (%)		11.37		10.76		11.02	

G_1- Acc (BSH) 622; G_2 - Arshina Murta; G_3 - Basari Balli; G_4 - Bugadi Sara; G_5 – Dadiga; G_6 - Harthebail Gidda; G_7 - Harthebail Kare; G_8 - Havali Special; G_9 - Huchchu Menasu; G_{10} - Huklakai Special; G_{11} - Jeerige Munda; G_{12} - K. K. King; G_{13} – Kalyani; G_{14} - Kari Dadiga; G_{15} - Keregadde Mallisara; G_{16} - Kodamod Special; G_{17} - Kodnamane Special; G_{18} - Kudure Bala; G_{19} – Kuduru gutta; G_{20} - Kurimale; G_{21} - Magod Jaddi; G_{22} – Malabar; G_{23} - Master Kare; G_{24} - Nuchchu Menasu; G_{25} - SV 2; G_{26} - SV 3; G_{27} - SV 4; G_{28} - SV 5; G_{29} - SV 6; G_{30} - SV 7; G_{31} - SV 8; G_{32} - SV 9; G_{33} - SV 10; G_{34} - SV 11; G_{35} - SV 12; G_{36} - SV 13; G_{37} - SV 14; G_{38} - SV 15; G_{39} - SV 16; G_{40} - SV 17; G_{41} - SV 18; G_{42} - SV 19; G_{43} – SV 21; G_{44} - SV 22; G_{45} - Sambar Dadiga; G_{46} – Shamemane; G_{47} – Tattikai; G_{48} – Tattikudi; G_{49} - Tirupugare; G_{50} – Uddakare; G_{51} – Sigandini; G_{52} - Panniyur 1

Table 3 : Dry recovery in black pepper genotypes of Uttara Kannada District, Karnataka

Dry recovery (%)							
Genotype	**2020-21**	**2021-22**	**Pooled**	**Genotype**	**2020-21**	**2021-22**	**Pooled**
G_1	32.51	32.69	32.60	G_{27}	32.22	31.80	32.01
G_2	30.78	32.03	31.41	G_{28}	32.08	32.57	32.33
G_3	31.78	32.16	31.97	G_{29}	32.32	31.98	32.15
G_4	31.89	32.06	31.98	G_{30}	34.10	34.53	34.32
G_5	32.82	33.06	32.94	G_{31}	31.00	31.24	31.12

G_6	30.84	29.91	30.38	G_{32}	30.99	31.08	31.04
G_7	30.87	30.26	30.57	G_{33}	31.57	30.98	31.28
G_8	36.11	32.89	34.50	G_{34}	35.57	34.97	35.27
G_9	29.98	30.43	30.21	G_{35}	30.82	31.09	30.96
G_{10}	32.58	31.79	32.19	G_{36}	31.59	31.71	31.65
G_{11}	30.84	32.33	31.59	G_{37}	31.52	31.42	31.47
G_{12}	32.72	31.86	32.29	G_{38}	31.37	30.93	31.15
G_{13}	31.84	30.69	31.27	G_{39}	30.99	30.52	30.76
G_{14}	34.81	34.83	34.82	G_{40}	33.88	34.08	33.98
G_{15}	32.91	32.49	32.70	G_{41}	32.17	32.56	32.37
G_{16}	31.09	31.86	31.48	G_{42}	31.29	31.01	31.15
G_{17}	33.82	33.07	33.45	G_{43}	32.61	32.04	32.33
G_{18}	34.78	35.89	35.34	G_{44}	30.21	30.77	30.49
G_{19}	31.91	32.49	32.20	G_{45}	34.64	35.13	34.89
G_{20}	34.09	34.71	34.40	G_{46}	33.48	33.19	33.34
G_{21}	34.84	36.03	35.44	G_{47}	32.38	32.93	32.66
G_{22}	33.18	33.59	33.39	G_{48}	30.27	31.01	30.64
G_{23}	31.88	31.63	31.76	G_{49}	31.98	32.09	32.04
G_{24}	30.84	31.89	31.37	G_{50}	32.92	32.03	32.48
G_{25}	31.02	31.89	31.46	G_{51}	37.31	38.16	37.74
G_{26}	32.11	32.67	32.39	G_{52}	34.54	33.80	34.17
		2020-21		**2021-22**		**Pooled**	
S. Em±		1.178		1.179		1.179	
C.D. at 5 %		3.346		3.347		3.348	
CV (%)		10.81		10.72		10.69	

G_1- Acc (BSH) 622; G_2 - Arshina Murta; G_3 - Basari Balli; G_4 - Bugadi Sara; G_5 – Dadiga; G_6 - Harthebail Gidda; G_7 - Harthebail Kare; G_8 - Havali Special; G_9 - Huchchu Menasu; G_{10} - Huklakai Special; G_{11} - Jeerige Munda; G_{12} - K. K. King; G_{13} – Kalyani; G_{14} - Kari Dadiga; G_{15} - Keregadde Mallisara; G_{16} - Kodamod Special; G_{17} - Kodnamane Special; G_{18} - Kudure Bala; G_{19} – Kudurugutta; G_{20} - Kurimale; G_{21} - Magod Jaddi; G_{22} – Malabar; G_{23} - Master Kare; G_{24} - Nuchchu Menasu; G_{25} - SV 2; G_{26} - SV 3; G_{27} - SV 4; G_{28} - SV 5; G_{29} - SV 6; G_{30} - SV 7; G_{31} - SV 8; G_{32} - SV 9; G_{33} - SV 10; G_{34} - SV 11; G_{35} - SV 12; G_{36} - SV 13; G_{37} - SV 14; G_{38} - SV 15; G_{39} - SV 16; G_{40} - SV 17; G_{41} - SV 18; G_{42} - SV 19; G_{43} – SV 21; G_{44} - SV 22; G_{45} - Sambar Dadiga; G_{46} – Shamemane; G_{47} – Tattikai; G_{48} – Tattikudi; G_{49} - Tirupugare; G_{50} – Uddakare; G_{51} – Sigandini; G_{52} - Panniyur 1