

A High Yielding White Colored Finger Millet Variety GNN-7 for Cultivation in South and Middle Gujarat

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Abstract: The finger millet culture WWN-25 is a pure line selection from the germplasm accession collected from the Dang District. This has recorded an overall increase of 19.48 per cent in grain yield (2477 kg/ha) over the local check variety GN-5 (1997 kg/ha) and 18.41 per cent increase over the national check variety VL-149 (2015 kg/ha). Also this culture has recorded yield advantage of 14.84 per cent, 6.43 per cent and 29.35 per cent over national check viz, VL-149, PR-202 and VR-708 respectively. The culture matures in 125 days includes under medium duration variety. The culture WWN-25 has 8.5 top curved fingers per ear head and 6.6 cm ear head length. It endowes with the special attributes of easy threshability, synchronised maturity and non-lodging growth habit. It is rich in calcium (468.0 mg/100g), phosphorus (293.3 mg/100g) and good amount of protein (5.92 %), fat (1.32 %), crude fiber (3.48 %), carbohydrates (68.10 %) and minerals (2.62 %). This culture is moderately resistance to the major disease of leaf, neck and finger blast and also foot rot when compared to local check GN-5 and national check VL-149. WWN-25 finger millet culture has been released as a new variety GNN-7 (Gujarat Navsari Nagli-7) for cultivation during kharif as rainfed in south and middle Gujarat.

Keywords: Finger millet, high yielding variety, yield attributing characters, nutritional quality etc.

INTRODUCTION

Finger millet [*Eleusine coracana* (L.) Gaertn] is one of the important small millets gaining importance due to its inherent hardy nature and nutritional quality of grain. In India finger millet ranks third among millets after sorghum and pear millet. The crop is hardy and well suited to upland farming ecosystems, because of its early maturity and quick growing nature. It is grown in 2.0 million hectare of land in India with an average productivity of 1500 kg/ha (Anon, 2013). In Gujarat, finger millet or nagli or ragi is the most important traditional millet crop grown over an area of 11,000 hectare with the productivity as 1335 kg/ha and provides food and nutritional security of the marginal farmers in the rainfed dry lands and hilly tribal areas (Anon, 2014). In Gujarat, it is mainly cultivated as rainfed crop in *kharif* in less fertile hilly soils of Dangs, Valsad and Navsari districts of South Gujarat and Panchmahal district of middle Gujarat.

The crop is moderately resistant to disease and pest and assures reasonable economic return even under adverse growing conditions. It has been found to have good nutritional properties as its grain contain 65-75 per cent carbohydrates, 5-8 per cent protein, 15-20 per cent dietary fiber and 2.5-3.5 per cent minerals (Chetan and Malleshi, 2007). Excellent grain storage quality attributable to polyphenol content (Chetan and Malleshi, 2007) makes finger millet an ideal cereal for famine reserve. Thus, finger millet can be used for producing a variety of nutritionally designed foods from infants to geriatrics. On account of these advantages, ragi can therefore be exploited for use in value added nutritive health foods. Further, in view of growing importance of finger millet as therapeutic diet and baby food, there is a need to enhance genetic yield potential and evolve a new high yielding variety for nagli growing areas in Gujarat. With this

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objective breeding work was initiated at Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) and new medium maturing, high yielding and moderately resistance to blast and foot rot disease with good nutritional quality was developed.

The colour of ragi grains may vary from white through orange red, deep brown and purple to almost black. Brown is the predominant grain colour. Among brown and white grain types, white grains are preferred because of high protein, low fiber, low tannin and consumer acceptability (Sonod *et al.*, 2008). The dark colour of finger millet is acting as deterrent for its wide spread acceptability, especially by the non-traditional/urban millet consumers. To provide these non-traditional millet consumers with readily acceptable millet products, efforts are being done to improve the grain quality in terms of colour.

MATERIAL AND METHODS

The finger millet culture WVN-25 was evolved at Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) and released as Gujarat Navsari Nagli-7 (GNN-7). It is a pure line selection

from the germplasm accession. Single plant with desirable traits and high yield with medium maturing and moderately resistant to foot rot and blast disease was selected from the germplasm accession and was forwarded as single plant to progeny rows. The promising culture was evaluated over seven years with checks at Waghai and Dahod locations starting from 2009-10 to 2015-16, on farm trials during *kharif* 2015 in farmer's field of Dangs districts and also tested in All India Co-ordinated trials in 10 states across 16 locations during 2012-13. Besides, the reaction of the cultures against important pest and disease was screened and as per the standard procedures the grain qualities were analyzed.

RESULTS AND DISCUSSION

The evaluation trial data of the culture WVN-25 from the station trials at Hill Millet Research Station, Waghai (Dangs) and Agricultural Research Station, Dahod are presented in Table 1. The culture WVN-25 was tested in station trials at Waghai and Dahod from 2009-10 to 2015-16. At Waghai, the culture WVN-25 recorded an average grain yield of 2477 kg/ha where as the check GN-5 recorded

Table 1
Comparative performance of finger millet culture WVN- 25 at different locations

Name of the experiment and year	Location	CD at 5%	Grain yield (kg/ha)			CV%
			WVN-25	GN-5 (LC)	VL-149 (NC)	
LSVT-I 2009-10	Waghai	3480	3144	2436	NS	12.05
LSVT 2010-11	Waghai	3266*#	2652	2352	266	5.37
LSVT 2011-12	Waghai	1960*	1529	1863	264	9.30
LSVT 2012-13	Waghai	2822*#	2508	2195	268	6.57
	Dahod	2844*#	1356	2107	477	12.67
LSVT 2013-14	Waghai	3057	2743	2751	NS	12.70
	Dahod	1952*#	1449	718	453	21.21
LSVT 2014-15	Waghai	2007	2503	1829	681	16.03
	Dahod	1251#	1175	905	210	11.82
LSVT 2015-16	Waghai	2575*	2137	2338	437	11.45
	Dahod	1351*	1006	1284	248	12.71
MLT-2015-16	Waghai	2493	2295	3457	549	12.24
	Dahod	1966*	1468	1966	401	11.99
Over all Mean	2477	1997	2015	-	-	
% increase over Local and National checks		19.48	18.41	-	-	

Note : *Significantly superior over GN-5 (LC), #- Significantly superior over VL-149 (NC)

1997 kg/ha and VL-149 recorded 2015 kg/ha grain yield, which is 19.48 and 18.41 per cent increased yield over check GN-5 and VL-149, respectively. In all India co-ordinated trials during 2012-13 at 10 states across 16 locations, the culture WWN-25 gave 2732 kg/ha grain yield which was 14.84, 6.43 and 29.35 per cent increase over the national checks VL-149, PR-202 and VR-708, respectively (Table 2).

The culture WWN-25 was also tested under Advanced Varietal Trial for grain yield (kg/ha) during the year 2013-14 and 2014-15 and recorded 3045 kg/ha average grain yield which was 14.69 (2655 kg/ha) per cent and 5.02 (3130 kg/ha) per cent increase over national check GPU-67 and PR-202, respectively (Table 3). When the culture WWN-25 was tested in on farm trials at various villages of

Dangs, recorded an average grain yield of 1547 kg/ha, which was 31.32 per cent higher over the check variety GN-5 (1178 kg/ha).

Reaction to Pest and Diseases

Blast and Foot rot are the major diseases and the genotype WWN-25 moderately resistant to both diseases (Table 4) when sown in normal growing *kharif* season. Similarly, there is no major incidence of pest infection (Table 5).

Nutritional Quality

This culture possessed high calcium (468.0 mg/100 g), phosphorus (293.3 mg/100 g), magnesium (229.3 mg/100 g) and good amount of minerals and crude fibers then both the checks (Table 6). Similarly,

Table 2
Performance of finger millet culture WWN-25 in under Initial Varietal Trial (IVT) in AICRP-coordinated trails for Grain yield (kg/ha) during 2012-13. (Tested over 16 AICRP locations of India)

Sr. No.	Name	Center wise Grain Yield (kg/ha)									
		Vizianagaram A.P (1)	Dholi Bihar (2)	JAG CT (3)	Waghai Gujarat (4)	Dahod Gujarat (5)	Ranchi JH (6)	Banglore Karnataka (7)	Mandya Karnataka (8)	Kolhapur MH (9)	Dapoli MH (10)
1.	WWN-25	3181	3086	4352	2809	3506	2870	4531	4207	2327	1028
2.	VL-149 (NC)	2566	1852	2531	3002	2896	3642	2691	2953	2136	1403
3.	PR-202 (NC)	3452	1173	2932	2955	2914	3488	3105	3279	2228	903
4.	VR-708 (NC)	1448	2346	2068	1242	2296	3735	3204	2593	1765	1160
	SE m+	197	110	166	205	256	156	203	363	230	54
	CD at 5%	558	311	470	582	725	440	575	1027	652	152
	CV (%)	12.27	9.30	9.35	12.63	15.16	8.81	9.06	17.50	19.40	8.69
		% Increase over checks									
		Berhampur Odisha (11)	Coimbtur T.N (12)	Paiyur T.N (13)	Almora U.K (14)	Pantnagar U.K (15)	Ranichauri U.K (16)	India (Mean)	VL-149	PR-202	VR-708
1	WWN-25	1630	2599	3282	751	1253	2291	2732	14.84	6.43	29.35
2	VL-149 (NC)	1580	3108	3276	968	1093	2469	2379	-	-	-
3	PR-202 (NC)	1975	2321	3595	1778	1742	3180	2567	-	-	-
4	VR-708 (NC)	840	3419	3397	1106	1147	2030	2112	-	-	-
	SE m+	99	247	175	148	131	99				
	CD at 5%	281	699	496	418	371	281				
	CV (%)	11.18	15.36	8.87	16.30	13.23	6.43				

(State - 10, Total AICRP Locations - 16)

Table 3
Average performance of finger millet culture WWN-25 under AICRP trials (AVT-III) for Grain yield (kg/ha) during the year 2013-14 and 2014-15.

Name of Culture	Yield (kg/ha)		% increase over national checks		
	2013-14	2014-15	Average (India)	GPU-67	PR-202
WWN-25	2803	3287	3045	14.69	5.02
GPU-67	2383	2927	2655	-	-
PR-202	-	3130	3130	-	-

Table 4
Reaction of WWN-25 against major diseases of Nagli during the year 2014-15. (Year: 2014-15 AICSMIP-A.R.) (Average of 7 AICRP locations)

Reaction to Blast (PDI)(Av. of 7 AICRP locations)					
Sr. No.	Name of entry	Leaf Blast	Neck blast	Finger blast	Brown Spot (G)
1.	WWN-25	2.5	7.6	6.6	0.7
2.	GPU-67 (NC)	2.5	15.0	11.4	1.0
3.	PR-202 (NC)	2.9	6.3	7.1	1.2

Table 5
Reaction of WWN- 25 against important pests at HMRS, Waghai. (Year: 2013-14 and 2014-15)

Sr. No.	Name of entry	Aphids grade (1-5)	SB Dead hearts %
1.	WWN- 25	1.30	0.97
2.	GN- 5 (LC)	1.26	0.63
3.	VL-149 (LC)	0.33	1.45

Table 6
Nutritional value of white culture WWN-25 as compared to local and national checks (per 100 g)

Name of Culture	Protein (%)	Fat (%)	Mineral matter (%)	Crude fiber (%)	Carbo-hydrates (%)	Ca (mg)	P (mg)	Fe (mg)	Mg (mg)
WWN-25*	5.92	1.32	2.62	3.48	68.10	468.0	293.3	4.46	229.3
GN-5* (LC)	6.75	1.38	2.60	3.30	72.50	468.9	268.6	4.97	223.2
VR-708** (NC)	7.00	1.97	1.95	4.10	70.10	398.0	276.0	6.90	75.0

Note: * - Food Quality Testing Laboratory, NAU, Navsari.

Chaudhari *et al* (2012) also reported superior nutritional quality of white grain finger millet variety GN-5.

Morphological Characters

The culture WWN-225 matures in 125-130 days and attains 50 per cent flowering in 97-100 days after sowing. It has an erect plant habit with 110-115 cm plant height. The ear head is semi-compact with 8.5

fingers which are top curved. The 1000 grain weight is 2.71 g. The colour of the grain is white (Table 7). Ravikumar and Seetharam (1993) and Ravindran *et al.* (1996) also reported significant and positive association of grain yield with productive tillers per plant and fingers per ear head.

Considering the superior performance of the culture WWN-225 over the local check varieties namely GN-5 and national check var. VL-149, the

Table 7
Descriptive Morphological/Botanical characters of WWN-25 (GNN-7) and GN-5 as per DUS guidelines.

Sr. No.	Characteristics	WWN-25 (GNN-7)	GN-5
		States	States
1.	Plant Growth Habit	Erect	Erect
2.	Pigmentation at leaf juncture	Absent	Absent
3.	Days to 50% flowering	Late (97-100 days)	Late (107 days)
4.	Ear shape	Semi-compact	Open
5.	Ear head length (cm)	Medium (6.6)	Medium (8.0)
6.	Plant height at maturity (cm)	Medium (110-115)	Medium (100-110)
7.	Seed color	White	White
8.	Seed shape	Round	Round
9.	1000 grain weight (g)	Medium (2.71)	Medium (2.62)
10.	Seed Shattering	Absent	Absent
11.	No. of Productive tillers/plant	Low (2.15)	Low (1.70)
12.	Number of Fingers on main ear head	High (8.5)	Medium (8.0)
13.	Seed surface	Smooth	Smooth
14.	Pericarp	Persistent	Persistent
15.	Finger branching	Absent	Absent
16.	Stem culm branching	Absent	Absent
17.	Finger position of branching	In thumb finger	In thumb finger
18.	Finger multiple whorl	Absent	Absent
19.	Foliage colour	Green	Green
20.	Seed: Covering by Glumes	Intermediate	Intermediate

culture WWN-225 was released as a new variety GNN-7 (Gujarat Navsari Nagli-7) for large scale cultivation in south and middle Gujarat during 2016.

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