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RESEARCH ARTICLE

GN-5: A new high yielding white grain finger millet variety

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SUMMARY

A white grain high yielding culture WWN-20 was developed at Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) and released as Gujarat Nagli-5 (GN-5) for South Gujarat during 2009. It is a pure line selection from the germplasm accession. This culture yields on an average 3065 kg/ha grain yield. The culture WWN-20 registered 24.89 and 18.92 per cent increased grain yield over the standard check varieties GN-3 and GN-4 in station trials, respectively. The culture matures in 120-130 days. The high yield in this culture was attributed to higher number of tillers, high fingers/ear head and bold seed size. The nutritional quality of culture WWN-20 in terms of protein, calcium, magnesium and iron content was also found better than variety GN-3 and GN-4. The grain quality especially colour of grain suits for consumer acceptance and value addition.

Key Words **:** Finger millet, Grain yield, Nutritional quality

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Finger millet (*Eleusine corocana* Gaertn.) is one of the important small millet crop grown for food grain and fodder, especially in tribal predominant areas. The crop is hardy and well suited to upland farming ecosystems, because of its early maturity and quick growing nature. In India among millets, ragi stands third only to sorghum and pearl millet. It is commonly known as *nagli* in the tribal belt of Gujarat and occupies an area of about 19,000 ha with an annual production of 16,000 tonnes (Annonymus, 2011). In Gujarat, it is mainly cultivated as rainfed crop in *Kharif* in the less fertile hilly soils of Dangs, Valsad, Navsari, Panchamahal and dahod districts.

The crop is performing well under diverse conditions of soil, climate and moisture. Finger millet is highly nutritious as its grains 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 (Iyengar *et al.,* 1945) attributable to polyphenol content (Chetan and Malleshi, 2007) makes finger millet an ideal cereal for famine reserves. The traditional method of consumption of ragi by rural communities is in the form of chapati/roti. The finger millet grains offer many opportunities for diversified utilization and in adding value.

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 (Sonad *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.

Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) is working on improvement of

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finger millet since long. Number of high yielding and improved varieties of finger millet *viz.,* GN-1, GN-2, GN-3 and GN-4 have been developed and released for commercial cultivation in Gujarat. They are either brown or red grain type. The research work to develop white grain ragi variety was started in the year 2002.

MATERIALS AND METHODS

The white grain ragi culture WWN-20 was evolved at Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) and released as Gujarat Nagli-5 (GN-5) during 2009. It is a pure line selection from the germplasm accession. Single plant with desirable attribute and high yield with white grain colour was selected from the germplasm accession and was forwarded as single plant to progeny rows. The promising progenies were assessed for their performance in comparison with the checks GN-3 and GN-4 under station trials at Hill Millet Research Station, N.A.U., Waghai (Dangs) from *Kharif* '2004 to *Kharif* '2008. The promising cultures were also evaluated for its pests and diseases reaction and nutritional quality during *Kharif'* 2008.

RESULTS AND DISCUSSION

The results are summarized below according to objectives of the study:

Yield performance:

The yield data of station trials are presented in Table 1. The white grain culture WWN-20 was compared with long duration check variety GN-3 for five years and with latest released variety GN-4 for three years. The results of station trials demonstrated the worth of WWN-20 as a superior culture compared to GN-3 and GN-4. The culture WWN-20 recorded an average yield of 3065 kg/ha and 3187 kg/ha over check varieties GN-3 (2454 kg/ha) and GN-4 (2680 kg/ha), respectively. The promising culture exhibited 24.89 per cent and 18.92 per cent increased grain yield over checks GN-3 and GN-4, respectively.

Morphological features:

The variety grows to a height of about 100-110 cm possessing semi-compact ears with slightly incurving tip. It matures in 120-130 days with a yield potential of about 3000-4000 kg/ha grain yield. The higher yield in this variety is mainly due to higher number of tillers, higher fingers/ear head and bold seeds. 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. The seed colour is attractive white.

Nutritional quality:

The nutritional value of WWN-20 was also evaluated and compared with brown grain varieties GN-3 and GN-4. The nutritional quality of WWN-20 was found better than checks GN-3 and GN-4 (Table 2). The culture possessed high protein (9.34%), calcium (432 mg/100 g), magnesium (413 mg/100 g) and iron content (198 ppm) than both the checks. Mahudeswaran *et al*. (1972) in their study of five white ragi varieties found that variety EC-854 (white) was rich in protein (11.73%) as well as calcium and phosphorus compared to other brown strains. The commercial crop of white and brown ragi varieties was also evaluated for their market price. It was observed that traders offered 20 per cent higher price for white grain type than brown type. The various traditional and value added products (biscuits, toast and papdi) were also prepared

Table 1: Performance of WWN-20 over years at Hill Millet Research Station, Waghai

Entry	Grain yield (kg/ha)					Mean grain yield (kg/ha)		% increase over
	2004 PET	2005 SSVT	2006 LSVT-I	2007 LSVT-II	2008 LSVT-III	M_1	M_2	
WWN-20	2758	3005	3306	2291	3965	3065	3187	-
GN-4*	-	-	2984	2108	2948	-	2680	18.92
GN-3*	2202	3053	2724	1878	2414	2454	-	24.89
C.D. (0.05)	235.75	242.00	212.79	243.68	295.21	-	-	-
CV%	6.65	4.67	5.45	7.89	6.18	-	-	-

* Check Entry: M_1: Average yield of 2004, 2005, 2006, 2007 and 2008, M_2: Average yield of 2006, 2007 and 2008

Table 2: Nutritional value of WWN-20 (Waghai, *Kharif'* 2008)

Entry	Protein (%)	Calcium (mg/100g)	Magnesium (mg/100g)	Phosphorus (mg/100g)	Iron (ppm)
WWN-20	9.34	432	413	209	198
GN-4	8.56	380	269	243	180
GN-3	7.78	380	259	228	172

Table 3: Reaction of WWN-20 to important diseases and pests (*Kharif* 2008)

Entry	Diseases			Pests		
	Leaf blast (score 0-9)	Neck blast (%)	Finger blasts (%)	Aphids (1-10)	Shoot borer (% dead hearts)	Ear head caterpillar (No.)
WWN-20	3.0	5.9	9.7	1.5	3.51	1.80
GN-4	3.3	8.6	8.9	1.5	3.00	1.90
GN-3	4.0	6.3	8.5	2.0	5.18	2.00

from white grain culture WWN-20. It was noticed that common man willing to buy the value added products prepared from white ragi.

Pests and diseases reaction :

The reaction of the culture against pest and diseases under natural field condition was also assessed during *Kharif* 2008. The data of disease reaction (Table 3) revealed that culture WWN-20 showed lesser incidence of leaf and neck blast. With regard to pests, promising culture WWN-20 was relatively less attacked by aphids and ear head caterpillars.

Considering the superior performance of the culture WWN-20 over the check varieties GN-3 and GN-4 in station trials, it was released as a new white grain variety named as Gujarat Nagli-5 (GN-5) for large scale production in South Gujarat during 2009.

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