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### A High Yielding Finger Millet Variety 'GNN-6' for Cultivation in Hilly Region in South and Middle Gujarat

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**Abstract:** The finger millet culture WN-259 is a pure line selection from the germplasm accession. This has recorded an overall increase of 17.78 per cent in grain yield (2536 kg/ha) over the local check variety GN-4 (2153 kg/ha) and 30.52 per cent increase over the national check variety VR-708 (1982 kg/ha). Also this culture has recorded yield advantage of 14.75 per cent, 6.35 per cent and 29.26 per cent over national check VL-149, PR-202 and VR-708 respectively. The culture matures in 125 days. The culture WN-259 has 9-10 top curved finger per ear head and 9.1 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 (505.2 mg/100g), phosphorus (350 mg/100g) and good amount of protein (5.10 %), fat (1.40 %) crude fibre (3.00 %), carbohydrates (68.7 %) and minerals (2.10%). 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-4 and national check VR-708. WN-259 finger millet culture has been released as a new variety GNN-6 (Gujarat Navsari Nagli-6) during the year 2014 for cultivation during *kharif* as rainfed in south and middle Gujarat.

**Key words:** Finger millet, high yielding variety for Gujarat, yield attributing characters 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. Wide

adaptability, nutritional quality, dual purpose (grain and dry fodder) nature of crop and high multiplication rate of finger millet makes it one of the ideal crop for use as a staple food crop and as an indispensable crop component in mixed crop-livestock system of farming prevalent in semi-arid

topics. 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 *kbharif* in less fertile hilly soils of Dangs, Valsad and Navsari districts of South Gujarat and Panchmahal district of middle Gujarat. It is a hardy crop with minimum disease and pest problems and assures reasonable economic return even under adverse growing conditions. It has been found to have good nutritional properties particularly high calcium, phosphorus and also good amount of protein, fat, fiber, carbohydrate and minerals. 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 objective breeding work was initiated at HMRS, NAU, Waghai (Dangs) and new medium maturing, high yielding and moderately resistance to blast and foot rot disease variety was developed.

### MATERIAL AND METHODS

The finger millet culture WN 259 was evolved at Hill Millet Research Station, Navsari Agricultural University, Waghai (Dangs) and released as Gujarat Navsari Nagli-6 (GNN-6) during the year 2014. 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 with checks at Waghai and Dahod locations starting from 2007-08 to 2013-14, multi-location trials during 2013-14, on farm trials during *kbharif* 2013 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 WN-259 from the station trials at Hill Millet Research Station, Waghai (Dangs) and Agricultural Research Station, Dahod are presented in Table 1. The culture WN-259 was tested in station trials at Waghai and Dahod from 2007-08, 2009-10 to 2013-14. At Waghai, the culture WN-259 recorded an average grain yield of 2848 kg/ha where as the check GN-4 recorded 2570 kg/ha and VR-708 recorded 2013 kg/ha grain yield, which is 10.81 and 40.54 per cent increased yield over check GN-4 and VR-708, respectively. Thus it has recorded an average grain yield of 2536 kg/ha which is 17.78 and 30.52 per cent increased yield over GN-4 and VR-708 checks. In all India co-ordinated trials during 2012-13 at 10 states across 16 locations, the culture WN-259 gave 2730 kg/ha grain yield which was 14.75, 6.35 and 29.26 per cent increase over the national checks VL-149, PR-202 and VR-708, respectively (Table-2). When the culture WN-259 was tested in on farm trials (Table-2) in farmers holding at various villages of Dangs, recorded an average grain yield of 3011 kg/ha, which was 16.07 percent higher over the check variety GN-4 (2594 kg/ha). The overall performance of the culture in station trials, All India Co-ordinated trial and On Farm Trial presented in Table-2. It gave 2759 kg/ha of grain yields which was 16.22, 37.77 and 15.97 per cent increase over the check GN-4, VR-708 and VL-149.

Table 1  
Performance of finger millet var. GNN-6 (WN -259) as compared with checks in station trials

| Entry      | Location           | Grain yield (kg/ha) |                   |                 |                    |                    |                   |             |      |                 |               |                 | Mean | % increase over | Over all mean | % increase over |
|------------|--------------------|---------------------|-------------------|-----------------|--------------------|--------------------|-------------------|-------------|------|-----------------|---------------|-----------------|------|-----------------|---------------|-----------------|
|            |                    | SSVT 2007-08        | LSVT-I 2009-10    | LSVT-II 2010-11 | LSVT-III 2011-12   | LSVT-IV 2012-13    | LSVT-V 2013-14    | MLT 2013-14 | Mean | % increase over | Over all mean | % increase over |      |                 |               |                 |
| WN-259     | Waghai(South Guj)  | 2590                | 2880 <sup>#</sup> | 2456            | 2561 <sup>*#</sup> | 2743 <sup>*#</sup> | 3504 <sup>#</sup> | 3201        | 2848 | -               | 2536          | -               | 2536 | -               |               |                 |
|            | Dahod(Middle Guj.) | 1251 <sup>*</sup>   | 790               | 3315            | 2183 <sup>*#</sup> | 3032 <sup>#</sup>  | 2403 <sup>#</sup> | 2600        | 2225 | -               | -             | -               | -    | -               |               |                 |
| GN-4(LC)   | Waghai             | 2884                | 2588              | 2208            | 1999               | 2430               | 3219              | 2660        | 2570 | 10.81           | 2153          | 17.78           | 2153 | 17.78           |               |                 |
|            | Dahod              | 409                 | 527               | 3325            | 1422               | 2482               | 2173              | 1821        | 1337 | 28.09           | 1982          | 30.52           | 1982 | 30.52           |               |                 |
| VR-708(NC) | Waghai             | -                   | 2357              | 2012            | 2064               | 1333               | 2299              | -           | 2013 | 40.54           | 1982          | 30.52           | 1982 | 30.52           |               |                 |
|            | Dahod              | -                   | 1613              | 3519            | 1370               | 2226               | 1027              | -           | 1951 | 20.19           | 1951          | 20.19           | 1951 | 20.19           |               |                 |

Note: \* - Significantly superior over GN-4 (LC)

# - Significantly superior over VR-708 (NC)

**Table 2**  
**Overall performance of finger millet var. GNN-6 (WN-259) as compared with checks.**

| Sr. No. | Name of Trial                                     | Grain yield (kg/ha) |                  |                  |                 |                  |
|---------|---|---------------------|------------------|------------------|-----------------|------------------|
|         |   | WN 259              | GN-4<br>(LC)     | VR-708<br>(NC)   | VL-149          | PR-202           |
| 1       | Research station trial<br>(2007-08, 2009-14, MLT) | 2536                | 2153<br>(17.78%) | 1982<br>(30.52%) | -               | -                |
| 2       | All India Co-ordinated trial<br>(2012-13)         | 2730                | -                | 2112<br>(14.75%) | 2379<br>(6.35%) | 2567<br>(29.26%) |
| 3       | On Farm Trial                                     | 3011                | 2594<br>(16.07%) | -                | -               | -                |
|         | <b>Over all Mean</b>                              | <b>2759</b>         | <b>2374</b>      | <b>2047</b>      | <b>2379</b>     | <b>2567</b>      |
|         | % increase over GN-4                              | 16.22               |                  |                  |                 |                  |
|         | % increase over VR-708                            | 37.78               |                  |                  |                 |                  |
|         | % increase over VL-149                            | 15.97               |                  |                  |                 |                  |
|         | % increase over PR-202                            | -                   |                  |                  |                 |                  |

Note: Data presented in parenthesis is per cent increase over checks

### Reaction to pest and diseases

Blast and Foot rot are the major diseases and the genotype WN-259 moderately resistant to both diseases (Table 3) when sown in normal growing *kharif* season. Similarly, there is no major incidence of pest infection (Table 4).

### Nutritional quality

This culture possessed high calcium (505.2 mg/100 g), phosphorus (350 mg/100 g) and good amount of protein, fiber, carbohydrates and minerals then both the checks (Table 5).

### Morphological characters

The culture WN-259 matures in 125 days and attains 50 per cent flowering in 97 days after sowing. It has an erect plant habit with 97 cm plant height. The ear head is compact with 9-10 fingers which are top curved. The 1000 grain weight is 2.72 g. The colour of the grain is dark brown (Table 6).

Considering the superior performance of the culture WN-259 over the check varieties namely GN-

**Table 3**  
**Reaction to major disease in GNN-6 (WN-259) as compared with checks**

| Sr. No. | Item<br>Damage Score | WN-259 | GN-4 (LC) | VR-708<br>(NC) |
|---------|----------------------|--------|-----------|----------------|
| 1       | Leaf Blast           | 2.4    | 2.7       | 2.6            |
| 2       | Neck Blast           | 5.8    | 9.0       | 20.5           |
| 3       | Finger Blast         | 6.7    | 11.8      | 23.5           |
| 4       | Foot rot             | 8.24   | 3.49      | 12.69          |

### Score chart for leaf blast

| Grade | Per cent area infected  |
|-------|---|
| 0     | No symptoms on the leaves   |
| 1     | Small brown specks of pinhead size to slightly elongate, necrotic grey spots with a brown margin, less than 1 % leaf area affected. |
| 2     | A typical blast lesion elliptical, 5-10 mm long, 1-5 % of leaf area affected.   |
| 3     | A typical blast lesion elliptical, 1-2 cm long, 5-25 % of leaf area affected.   |
| 4     | 25-50 % of leaf area affected   |
| 5     | More than 50 % of leaf area affected with coalescence of the lesions  |

**Rating scale for Neck and Finger blasts**

| Rating                             | % NB and FB |
|------------------------------------|-------------|
| Highly Resistant ( <b>HR</b> )     | 1.0         |
| Resistant ( <b>R</b> )             | 2.0 - 10.0  |
| Moderately Resistant ( <b>MR</b> ) | 11.0 -20.0  |
| Susceptible ( <b>S</b> )           | 21.0 -30.0  |
| Highly Susceptible ( <b>HS</b> )   | >30.0       |

\* The disease rating was recorded by adopting the methodology suggested by Dr. A Nagaraja, Pathologist, PC Unit (SM), GKVK, Bangalore (2012-13).

**Table 4**  
**Reaction to important insect pests in GNN-6 (WN-259) as compared with checks**

| Sr. No.      | Name of Pest | WN-259 | GN-4 | VR-708 |
|--------------|--------------|--------|------|--------|
| Damage Score |              |        |      |        |
| 1            | Aphid        | 1.0    | 1.0  | 1.0    |
| 2            | Stem boner   | 0.5    | 4.0  | 0.0    |
| 3            | Earhead      | 1.2    | 6.6  | 3.3    |

**Table 5**  
**Nutritional value of culture WN-259 (GNN-6) as compared to local and national checks as well as with other cereals. (per 100 g)**

| Name of Culture | Protein (%) | Fat (%) | Mineral matter (%) | Crude fiber (%) | Carbo-hydrates (%) | Ca (mg/100g) | P (mg/100g) | Fe (mg/100g) | Mg(mg/100g) |
|-----------------|-------------|---------|--------------------|-----------------|--------------------|--------------|-------------|--------------|-------------|
| WN-259          | 5.90        | 1.40    | 2.10               | 3.00            | 68.7               | 505.2        | 350.0       | 5.52         | 180.1       |
| GN-4            | 6.50        | 1.20    | 2.70               | 3.60            | 72.00              | 480.0        | 288.0       | 17.40        | 191.0       |
| VR-708          | 7.00        | 1.97    | 0.95               | 4.10            | 70.10              | 398.0        | 276.0       | 6.90         | 75.0        |
| Rice            | 6.80        | 0.50    | 0.60               | 0.20            | 78.20              | 45.0         | 160.0       | -            | -           |
| Wheat           | 11.80       | 1.50    | 1.50               | 1.20            | 71.20              | 41.0         | 306.0       | 4.90         | 138.0       |
| Sorghum         | 9.90        | 3.30    | 1.57               | 6.30            | 74.63              | 28.0         | 287.0       | 4.40         | 190.0       |

Source: Bio-chemical analysis of cultures by Food Quality Testing Laboratory, NAU, Navsari, Gujarat

**Table 6**  
**Varietal descriptors of GNN-6 (WN-259).**

| Sr. No | Descriptors                        | Measurements/ Units                       |
|--------|------------------------------------|---|
| 1      | Plant height (cm)                  | <b>97</b>                                 |
| 2      | Culm thickness (cm)                | <b>4.5</b>                                |
| 3      | Number of productive tillers       | <b>2.5</b>                                |
| 4      | Finger number                      | <b>10.0</b>                               |
| 5      | Days to flowering                  | <b>97</b>                                 |
| 6      | Days to maturity                   | <b>125</b>                                |
| 7      | Thousand grain weight (g)          | <b>2.72</b>                               |
| 8      | Grain yield (kg/ha)                | <b>2536</b>                               |
| 9      | Growth habit                       | <b>Erect</b>                              |
| 10     | Ear shape                          | <b>Compact (Finger top curved inside)</b> |
| 11     | Earhead length (cm)                | <b>9.1</b>                                |
| 12     | Grain colour (Post harvest)        | <b>Dark Brown</b>                         |
| 13     | Grain shape                        | <b>Round</b>                              |
| 14     | Synchrony of ear maturity          | <b>Synchronous</b>                        |
| 15     | Lodging susceptibility at maturity | <b>Low</b>                                |

4 and VR-708, the culture WN-259 was released as a new variety GNN-6 (Gujarat Navsari Nagli-6) for large scale cultivation in south and middle Gujarat during 2014.

### **REFERENCES**

Anonymous. (2013), Annual progress report. All India Co-ordinated Small Millet Improvement Project.

Anonymous. (2014), Zonal Research Extension Advisory Committee report.

John Joel, A., Kumaravadivel, N., Nirmalakumari, A., Senthil, N., Mohan Sundaram, K., Ravendran, T.S., and Mallikavangamudi, V. (2005), A high yielding finger millet variety Co (Rs) 14. *Madras Agric, J.* 92 (7-9) : 375-380.