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Research Article

RED SEEDED, EARLY MATURING FINGER MILLET VARIETY 'GN-8' FOR CULTIVATION IN GUJARAT

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Abstract: The proposed culture, WN-585 is early maturing and have been developed through selection from local germplasm collected from the Dangs district. WN-585 was tested under various categories of trials at Waghai, Varanasi and Dahod centers in 12 different state MLT trials and under IVT trial (during 2017-18) at 12 AICRP small millets locations across seven states at national level. The early maturing culture WN-585 (3065 kg/ha) performed well with 21.3 % and 13.7 % grain yield superiority over national check 'VL-149' and 'VL-352', respectively in Gujarat. At national level, it showed 20.2 % grain yield improvement over national check 'VL-352'. The proposed culture was found to have good nutritional properties particularly high calcium, iron, phosphorous and also good amount of protein, fibre and minerals. With respect to pest and diseases, it was found superior to checks and moderately resistant for the same. Considering the increasing demand of early maturating as well as for late cultivations *i.e.*, after rice plantation the culture WN-585 (GN-8) with early maturing, high yield potential culture, desirable grain quality and moderately resistant to foot rot and blast disease. It is proposed to release this culture for early maturing Nagli growing dry lands, hill and tribal areas of South and Middle Gujarat.

Keywords: Finger millet, high yielding early maturing variety, yield attributing characters

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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 crops for use as a staple food crop and as an indispensible 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 1750 kg/ha [1]. In Gujarat, finger millet or nagli or ragi is the most important traditional millet crop grown over an area of 1420 hactare with the productivity as 1635 kg/ha and provides food and nutritional security of the marginal farmers in the rainfed dry lands and hilly tribal areas [2]. 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. 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, fibre, 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 and new early maturing, high yielding and moderately resistance to blast and foot rot disease variety was developed. Gautam and Kaushik (1981) given the similar findings in improved cultivation techniques in small millets [3].

Material and Methods

The finger millet culture WN-585 was evolved at Hill Millet Research Station, Navsari Agricultural University, Waghai, Dist. Dangs and released as Gujarat Navsari Nagli-8 (GN-8) during the year 2017-2018. It is a pure line selection from the eighty eight early maturing germplasm accessions. 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 local as well as national checks at Waghai, Vanarasi and Dahod locations starting from 2014-15 to 2017-18 under multi-location trials and on farm trials in farmer's field of Dangs districts as well as also tested in All India Coordinated trials on small millets in 12 states across 7 locations in India during 2017-18.

Results and Discussion

The proposed culture WN-585 was tested under twelve different state varietal trials *viz*; Preliminary Yield Trial, Small Scale Varietal Trial, Large Scale Varietal Trial, Multilocation Yield Trials at Waghai, Vanarasi and Dahod from 2014 to 2017. The finger millet early maturing variety WN-585 (3065 kg/ha) performed well with 21.3 % and 13.7 % grain yield superiority over national check VL-149 and VL-352, respectively in Gujarat [Table-1, 2 and 3] [2]. The proposed culture WN-585 was also tested in AICRP- Small Millets over 7 states at 12 AICRP locations across India in IVT- finger millet. The proposed culture 'WN-585' showed 20.2 % yield improvement over National check VL-352 [2].

Special features of the Finger Millet variety 'GN-8':

1. Ear head: Semi-compact
2. Early maturity: 105-112 days
3. Seed color and Size: Red with Bold size
4. Erect and Non lodging plant type
5. Earhead Fingers are slightly yellowish during grain filling stage and turn's uniform brown colour during its maturity [Table-4].

The evaluation trial data of the culture WN-585 from the station trials at Hill Millet Research Station, Waghai, Dist. The Dangs and Agricultural Research Station, Dahod are presented in [Table-1].

Table-1 Comparative performance (kg/ha) of finger millet culture WN- 585 (GN-8) in Gujarat

Name of the experiment and year	Location	General Mean	Grain yield (kg/ha)				S. Em. ±	CD at 5%	CV %
			WN-585	GNN-6 (LC-Late)	VL-149 (NC-Early)	VL-352 (NC-Early)			
PET-2014	Waghai	3065	3556	3333	2951	--	281	805	15.9
Mean			3556 (1)	3333 (1)	2951 (1)	--			
% Inc. over				6.3	17.0				
SSVT-2015	Waghai	3302	3518[b]	3487	2338	--	225	645	11.8
	Dahod	1645	2112[b]	1891	1284	--	148	424	15.6
Mean			2815 (2)	2689 (2)	1811 (2)				
% Inc. over				4.5	35.7				
SSVT-2016	Waghai	2744	3187[bc]	3153	2580	2702	129	377	8.2
	Dahod	2061	2217	2480	1912	2151	148	322	9.3
Mean			2702 (2)	2817 (2)	2246 (2)	2427 (2)			
% Inc. over				--	16.9	10.2			
LSVT -2016	Waghai	2875	3091[bc]	3510	2656	2614	132	376	7.8
	Dahod	2586	2949[bc]	2762	1952	2080	112	429	9.7
Mean			3020 (2)	3136 (2)	2304 (2)	2347 (2)			
% Inc. over				--	23.7	22.3			
LSVT -2017	Waghai	3944	3959[c]	4286	3479	3307	187	541	8.0
	Dahod	2541	2955	3110	2240	2628	455	1324	9.6
	Vanarasi	2173	2558	2870	2384	2494	146	420	11.4
Mean			3157 (3)	3422 (3)	2701 (3)	2810 (3)			
% Inc. over				--	14.4	11.0			
MLT-2017	Waghai	3638	3770	3876	3267	3311	182	529	7.8
	Dahod	2737	2905[b]	3126	1904	2535	162	475	10.2
Mean			3338 (2)	3501 (2)	2586 (2)	2923 (2)			
% Inc. over					22.5	12.4			
Over all Mean			3065	3157	2412				
% Inc. over checks					21.3				
Over all Mean			3066			2647			
% Inc. over check						13.7			
Weighted Mean		2774	3042	3120	2389	2629			

Note: a- significantly superior over GNN-6 (LC),b- significantly superior over VL-149 (NC), c- significantly superior over VL-352 (NC)

Table-2 Comparative performance (kg/ha) of finger millet culture WN- 585 (GN-8) in South Gujarat

Name of the experiment and year	Location	No. of entries	Name of entries				S. Em. ±	CD at 5%	CV %
			WN-585	GNN-6 (LC-Late)	VL-149 (NC-Early)	VL-352 (NC-Early)			
PET-2014	Waghai	20 (15+5)	3556	3333	2951	--	281	805	15.9
Over all Mean			3556 (1)	3333 (1)	2951 (1)	--			
% Inc. over				6.3	17.0	--			
SSVT-2015	Waghai	20 (16+4)	3518[b]	3487	2338	--	225	645	11.8
Over all Mean			3518 (1)	3487 (1)	2338 (1)	--			
% Inc. over				0.8	33.5	--			
SSVT-2016	Waghai	21 (16+5)	3187[bc]	3153	2580	2702	129	377	8.2
Over all Mean			3187 (1)	3153 (1)	2580 (1)	2702 (1)			
% Inc. over				1.1	19.0	15.2			
LSVT-2016	Waghai	15 (11+4)	3091[bc]	3510	2656	2614	132	376	7.8
Over all Mean			3091 (1)	3510 (1)	2656 (1)	2614 (1)			
% Inc. over				--	14.1	15.4			
LSVT-2017	Waghai	16 (11+5)	3959[c]	4286	3479	3307	187	541	8.0
	Vanarasi	16 (11+5)	2558	2870	2384	2494	146	420	11.4
Over all Mean			3259 (2)	3578 (2)	2932 (2)	2901 (2)			
% Inc. over				--	10.0	11.0			
MLT-2017	Waghai	14 (7+7)	3770	3876	3267	3311	182	529	7.8
Over all Mean			3770 (1)	3876 (1)	3267 (1)	3311 (1)			
% Inc. over				--	13.3	12.2			
Over all Mean			3377	3502	2808				
% increase over checks					16.9				
Over all Mean			3313			2886			
% increase over check						12.9			
Top Non significant group			6/7	7/7	1/7	1/5			

Note: a- significantly superior over GNN-6 (LC), b- significantly superior over VL-149 (NC), c- significantly superior over VL-352 (NC)

Table-3 Comparative performance (kg/ha) of finger millet culture WN- 585 (GN-8) in Middle Gujarat

Name of the experiment and year	Location	No. of entries	Name of entries				S.Em. ±	CD at 5%	CV %
			WN-585	GNN-6 (LC-Late)	VL-149(NC-Early)	VL-352 (NC-Early)			
SSVT-2015	Dahod	20 (16+4)	2112[b]	1891	1284	--	148	424	15.6
SSVT-2016	Dahod	21 (16+5)	2217[b]	2480	1912	2151	148	322	9.3
LSVT-2016	Dahod	15 (11+4)	2949[bc]	2762	1952	2080	112	429	9.7
LSVT-2017	Dahod	16 (11+5)	2955	3110	2240	2628	455	1324	9.6
MLT-2017	Dahod	14 (7+7)	2905[b]	3126	1904	2535	162	475	10.3
Over all Mean			2628	2674	1858				
% increase over checks					29.29				
Over all Mean			2757			2349			
% increase over check						14.8			
Top Non significant group			5/5	5/5	0/5	0/5			

Note: a- significantly superior over GNN-6 (LC), b- significantly superior over VL-149 (NC), c- significantly superior over VL-352 (NC)

Table-4 Reaction of WN-585 against major diseases of finger millet, Location: Waghai (Data for three years : 2015-16, 2016-17 and 2017-18)

SN	Name of entry	Reaction to Blast disease (%)									Reaction to Foot rot (%)		
		Leaf Blast			Neck blast			Finger blast					
		2015	2016	2017	2015	2016	2017	2015	2016	2017	2015	2016	2017
1	WN- 585	11.44	10.89	11.44	14.38	12.38	14.05	11.84	11.89	10.00	11.25	9.00	11.25
2	GNN-6(LC)	14.13	12.12	14.01	15.12	14.18	18.40	17.15	15.15	13.80	13.50	11.25	9.00
3	VL-149(NC)	19.78	16.67	10.00	9.76	8.81	7.38	21.56	20.22	23.83	11.25	13.50	11.25
4	VL-352(NC)	3.11	1.78	2.22	4.76	3.33	3.33	7.30	6.19	8.10	9.00	6.75	9.00

A. Score chart for leaf blast, B. Rating scale for Leaf, Neck and Finger blast disease

Table-5 Reaction of WN-585 against important pests of finger millet, Location: Waghai (For Three Years : 2015-16, 2016-17 and 2017-18)

SN	Name of entry	Aphids Index (1-5)			Hairy caterpillar/plot			SB Dead Hearts %		
		2015	2016	2017	2015	2016	2017	2015	2016	2017
1	WN- 585	1.22	1.40	1.33	1	2	1	7.50	14.64	8.52
2	GNN- 6 (LC)	1.50	1.20	1.26	2	2	2	10.60	18.90	10.52
3	VL-149 (NC)	1.60	1.85	1.70	4	3	5	10.55	22.30	11.45
4	VL-352 (NC)	1.55	1.40	1.33	2	1	1	9.20	13.40	10.80

Table-6 Ancillary / Morphological observations of promising culture WN-585

SN	Character	WN-585 (GN-8)	GNN-6 (LC-Late)	VL-149 (NC-Early)	VL-352 (NC-Early)
1.	Plant height (cm)	110 (105-115)	120 (115-125)	115 (110-120)	110 (105-114)
2.	Av. days to 50% flowering	78 (75-82)	95 (92-98)	74 (71-77)	75 (72-79)
3.	Av. days to maturity	110 (105-112)	130 (125-135)	104 (100-108)	106 (102-110)
4.	Ear head length (cm)	6.84 (6.7-6.9)	7.00 (6.8-7.2)	7.34 (7.2-7.5)	6.80 (6.6-7.0)
5.	No. of fingers/ear head	8.0 (7-10)	7.21 (6-9)	6.53 (6-8)	7.00 (6-8)
6.	No. of tillers/plant	2.68 (2-3)	3.60 (2-5)	2.16 (2-4)	2.57 (2-5)
7.	Grain yield (kg/ha)	3079 (2800-3300)	3160 (2900-3400)	2458 (2200-2600)	2698 (2300-2900)
8.	Fodder yield (kg/ha)	7850 (7000-8500)	9250 (8800-9500)	6950 (6700-7200)	7050 (6800-7200)
9.	1000 grain weight (g)	2.61 (2.5-2.7)	2.72 (2.6-2.8)	2.30 (2.2-2.4)	2.52 (2.5-2.6)
10.	Plant type	Erect	Erect	Erect	Erect
11.	Grain colour	Red	Brownish Red	Red	Brownish Red
12.	Stem	Thick	Thick	Thin	Thick
13.	Foliage	Green	Green	Green	Green
14.	Lodging	Non-lodging	Non-lodging	Lodging	Semi-Lodging
15.	Ear head habit	Semi-compact	Compact	Open	Semi-Compact

Table-7 Biochemical parameters of finger millet culture WN-585 (per 100 g)

SN	Name of entry	Protein (%)	Mineral matter (%)	Crude fiber (%)	Carbohydrates (%)	Ca (mg)	Zn (mg)	Fe (mg)	Mg (mg)
1	WN-585	6.92	3.72	3.54	68.10	578	2.49	3.85	270
2	GNN-6 (LC)	6.75	3.60	3.30	72.50	572	2.40	3.80	260
3	VL-149 (NC)	6.01	3.46	3.44	68.40	560	2.37	3.41	262
4	VL-352 (NC)	6.23	3.50	3.24	65.10	569	2.26	3.24	254

Note: Testing done at Food Quality Testing Laboratory, NAU, Navsari.

Table-8 Traders opinion for the market price of finger millet culture WN-585

SN	Name of Trader	Source	Seed Colour	Grain price (Rs / kg)
1.	APMC Market Waghai, Waghai, Dist. The Dangs.	A. WN-585	Reddish	Rs. 23 to 24 /-
		B. VL-352 (Early National check)	Copper brown	Rs. 21 to 22 /-
		C. GNN-6 (Late Local check)	Copper brown	Rs. 21 to 22 /-

Source: Author study - seed price Rs/kg as on dated, 20.02.17 (APMC Market, Waghai, Gujarat)

Annexure-I Descriptive Morphological /Botanical characters of WN-585 as per DUS test

SN	Characteristics	WN-585	Note	GNN-6 (LC)	Note	VL-149 (NC)	Note	VL-352 (NC)	Note
1	Plant Growth Habit	Erect	1	Erect	1	Erect	1	Erect	1
2	Pigmentation at leaf juncture	Absent	1	Absent	1	Absent	1	Absent	1
3	Leaf sheath pubescence	Absent	1	Absent	1	Present	9	Absent	1
4	Days to 50% flowering	Medium(78 days)	5	Late (92 days)	7	Medium(78 days)	5	Medium (78 days)	5
5	Glume - colour	Light Green	3	Dark Green	5	Light Green	3	Light purple	7
6	Stem culm branching	Absent	1	Absent	1	Present	9	Absent	1
7	Flag leaf: Blade length	Medium	3	Long	5	Medium	3	Medium	3
8	Flag leaf: Blade width	Medium	5	Medium	5	Medium	5	Medium	5
9	Peduncle length	Medium	5	Long	7	Medium	5	Medium	5
10	Ear shape	Semi-compact	5	Compact	3	Open	1	Semi Compact	5
11	Finger branching	Absent	1	Absent	1	Absent	1	Absent	1
12	Finger position of branching	In thumb finger	3	In thumb finger	3	In thumb finger	3	In thumb finger	3
13	Finger: Multiple whorl	Absent	1	Absent	1	Present	9	Absent	1
14	Ear head length (cm)	Medium (6.8)	4	Medium (7.5)	4	Medium (7.3)	4	Medium (6.8)	4
15	Finger length (cm)	Medium	5	Medium	5	Medium	5	Medium	5
16	Finger width (cm)	Medium	5	Wide	7	Medium	5	Medium	5
17	Number of Fingers on main ear head	High (8.0)	7	Medium (7.2)	5	Medium (6.50)	5	Medium (7.0)	5
18	No. of Productive tillers/plant	Low (2.68)	3	Medium (3.60)	5	Low (2.16)	3	Low (2.57)	3
19	Plant height (cm)	Medium	5	Medium	5	Medium	5	Medium	5
20	Seed Shattering	Absent	1	Absent	1	Absent	1	Absent	1
21	Seed : covering by glumes	Enclosed	2	Enclosed	2	Enclosed	2	Enclosed	2
22	Seed color	DarkBrown (Red)	8	Copper brown	6	Copper brown	6	Copper brown	6
23	Seed shape	Round	1	Round	1	Round	1	Round	1
24	Seed surface	Smooth	3	Smooth	3	Smooth	3	Smooth	3
25	Pericarp persistence after threshing	Persistent	9	Persistent	9	Persistent	9	Persistent	9
26.	1000 grain weight (g)	Medium	5	Medium	5	Medium	5	Medium	5

The culture WN-585 was tested in station trials at Waghai, Vanarasi centers under Navsrai Agricultural University, Navsari and Dahod under Anand Agricultural University, Anand from 2014-15 to 2017-18. At Waghai, the culture WN-585 recorded an average grain yield of 3065 kg/ha whereas the check VL-149 recorded 2412 kg/ha and VL-352 recorded 2647 kg/ha grain yield, which is 21.3 and 13.6 percent increased yield over both the checks, respectively. On the basis of per day productivity, the proposed culture showed 14.03 % grain yield advantage over local check GNN-6 (for late maturity duration) while 19.79 % over National check variety VL-149 (for early maturity duration) and 15.24 % over VL-352 (for early maturity duration). On the basis of per day productivity, WN-585 gives yield advantage of 18.72% and 10.65% over National checks VL-352 (for early) and GPU-67 (for late), respectively during the year 2017-18. The proposed culture WN-585 was also tested in AICRP- Small Millets over 7 states at 12 AICRP locations in IVT- finger millet and showed 20.19% yield improvement over National check VL-352. The overall performance of the culture in station trials, All India Co-ordinated trial and on station farm trial presented. As per APMC, Waghai it gives more value as compared with national checks due to reddish colour of bold seed which has more market acceptance [Table-8]. The vivid presentation with good quality photographs is enclosed. (Annexure –III) The finger millet early maturing variety WN-585 (3065 kg/ha) performed well with 21.3 % and 13.6 % grain yield superiority over national check VL-149 and VL-352, respectively in Gujarat. The genotype WN-585 is the attractive red colour with bold grain size, erect growing non-lodging plant type and good quality characters. It is moderately resistant to leaf, neck and finger blast and foot rot disease under field condition with tolerance reaction to pest like stem borer and aphids. WN-585 recommended for kharif cultivation in Gujarat as 'GN-8'.

Reaction to pest and diseases

The proposed culture WN-585 had showed moderately resistant to leaf, neck and finger blast and foot rot disease under field condition sown in normal growing kharif season [Table-4]. Also, showed tolerance to pest like stem borer and aphids. Similarly, there is no major incidence of other pest infection was noted [Table-5].

Morphological characters

The culture WN-585 matures early which is in 110 days and attains 50 percent flowering in 78 days after sowing. It has an erect plant habit with 110 cm plant height. The semi compact ear head is compact with 8-9 fingers which are top curved. The 1000 grain weight is 2.61 g. The colour of the grain is reddish medium bold size [Table-6]. Annexure-I indicates the descriptive Morphological and Botanical characters of WN-585 as per DUS test.

Nutritional quality

Good quality with high nutritional value. It is better in Fe (3.85 mg/100 g), Ca (578 mg/100 g), Zn (2.49 mg/100 g), Mg (270 mg/100 g), crude fibre (3.54 mg/100 g), protein 6.92 % and total mineral matter 3.72 % as compared with local checks variety 'GNN-6' and national checks variety 'VL-352' [Table-7]. Chetan and Malleshi (2007) reported the similar findings in GPU-28.

Molecular Characterisation

DNA finger printing was done by using ISSR Profiling with molecular marker *viz*., UBC 807, UBC 810, UBC 811, UBC 812, UBC 834 and UBC 856 with L -100bp ladder for proposed entry 'WN-585', local check GNN-6, national checks *viz*; VL-149 and VL-352. It showed easily identifiable distinct banding pattern under ISSR Profiling with molecular marker using UBC 807 at 1027.87 bp and 377.19 bp, using UBC 810 at 285.75bp and 338.59bp, using UBC 811 at 1227.23bp and 861.07bp, using UBC 812 at 918.37bp and 665.45bp, using UBC 834 at 792.38bp while using UBC 856 at 1006.5bp, 844.5bp, 560.75bp and 498.84bp. (Annexure – II). Considering the overall superior performance of the culture WN-585 over the check varieties namely GNN-6 and VL-352, the culture WN-585 was released as a new variety GN-8 (Gujarat Navsari Nagli-8) for large scale cultivation in early maturing finger millet areas of south and middle Gujarat during 2017. In release of different varieties of small millets similar findings were reported [3-5, 8-10].

Conclusion

WN-585, the finger millet early variety (3065 kg/ha), performed well with 21.3 % and 13.7 % yield advantage over national checks VL-149 and VL-352, respectively. WN-585 have attractive red coloured bold grain (2.61 g per 1000 seed weight), good and nutritious quality, early and synchronous maturity, erect growing and non-lodging plant type. It is moderately resistant to leaf, neck and finger blast as well as foot rot diseases under field condition with tolerance reaction to pest like stem borer and aphids. WN-585 recommended for kharif cultivation in Gujarat as GN-8.

Annexure-II. DNA finger printing of WN- 585 and checks

DNA finger printing was done by using ISSR Profiling with molecular marker *viz*., UBC 807, UBC 810, UBC 811, UBC 812, UBC 834 and UBC 856 with L -100bp

ladder for proposed entry 'WN-585', local check GNN-6, national checks *viz*., VL-149 and VL-352. It showed easily identifiable distinct banding pattern under ISSR Profiling with molecular marker using UBC 807 at 1027.87 bp and 377.19 bp, using UBC 810 at 285.75bp and 338.59bp, using UBC 811 at 1227.23bp and 861.07bp, using UBC 812 at 918.37bp and 665.45bp, using UBC 834 at 792.38bp while using UBC 856 at 1006.5bp, 844.5bp, 560.75bp and 498.84bp.

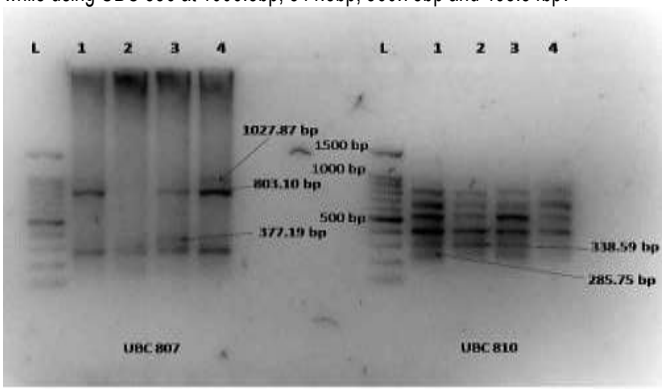

Fig-1 ISSR Profiling with UBC 807 & UBC 810, L -100bp ladder (1) WN-585, (2) GNN-6, (3) VL-149, (4) VL-352

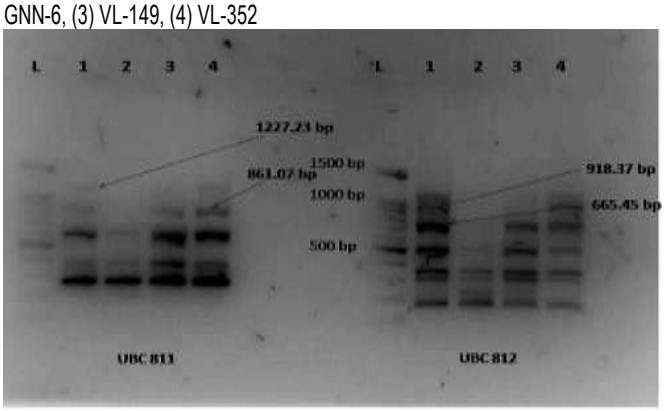

Fig-2 ISSR Profiling with UBC 811 & UBC 812, L -100bp ladder (1) WN-585, (2) GNN-6,(3) VL-149, (4) VL-352

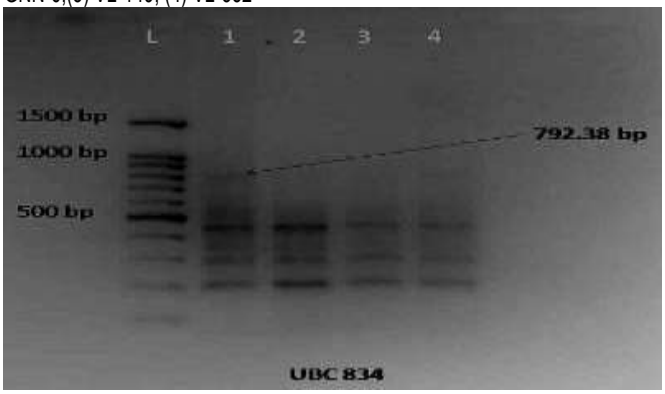

Fig-3 ISSR Profiling with UBC 834, L -100bp ladder (1) WN-585, (2) GNN-6, (3) VL-149, (4) VL-352

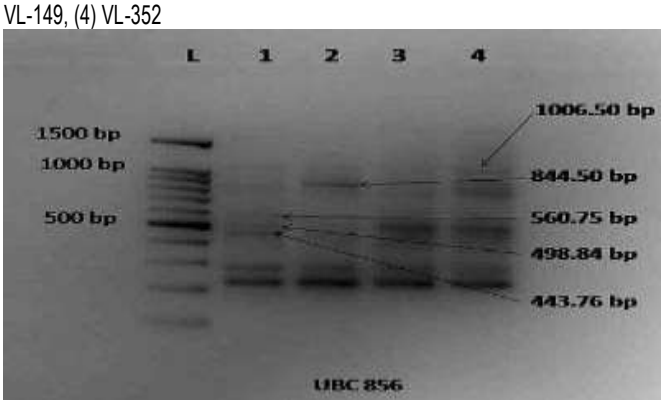

Fig-4 ISSR Profiling with UBC 856, L -100bp ladder (1) WN-585, (2) GNN-6, (3) VL-149, (4) VL-352

Annexure-III. PHOTOGRAPHS OF 'GN-8' (Culture WN-585)

Fig-5 Grains of 'GN-8'

Fig-6 Ear Head of 'GN-8' Fig-7 Field view of 'GN-8'

Application of research: GN-8 is finger millet good and nutritious quality, early and synchronous maturity, erect growing and non-lodging variety.

Research Category: Finger millet

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***Research Guide or Chairperson of research: Dr H. E. Patil**
University: Navsari Agricultural University, Navsari, 396 450
Research project name or number: Research station trials

Author Contributions: All author equally contributed

Author statement: All authors read, reviewed, agree and approved the final manuscript

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

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