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SR Jadeja

Assistant Professor, Vegetable
Research Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

SF Paghadar

Assistant Professor,
Polytechnic in Agriculture,
Junagadh Agricultural
University, Dhari, Gujarat,
India

VK Baraiya

Agriculture Officer, Vegetable
Research Station, Junagadh
Agricultural University,
Junagadh, Gujarat, India

AN Zalavadiya

M.Sc. Scholar, Department of
Vegetable Science, ASPEE
College of Horticulture,
Navsari Agricultural
University, Navsari, Gujarat,
India

Corresponding Author:**AN Zalavadiya**

M.Sc. Scholar, Department of
Vegetable Science, ASPEE
College of Horticulture,
Navsari Agricultural
University, Navsari, Gujarat,
India

Comparative performance of Gujarat coriander – 4 (Sorath Sugandha) for yield, quality and disease resistance in Gujarat

SR Jadeja, SF Paghadar, VK Baraiya and AN Zalavadiya

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Abstract

Coriander (*Coriandrum sativum* L.) is an important seed spice crop valued for its aroma, flavour and medicinal properties. The present study evaluated a promising coriander genotype GCr-4 (JCR-7) developed through mass selection from local germplasm. Multi-location trials were conducted during the *Rabi* seasons from 2016–17 to 2021–22 at Junagadh, Jagudan, Deesa, Navsari and Sanand in Gujarat and compared with check varieties GCr-2 and GCr-3. The results revealed that GCr-4 recorded higher and stable seed yield with 17.29% and 8.56% yield advantage over GCr-2 and GCr-3, respectively. The genotype also showed lower aphid infestation, resistance to powdery mildew and higher linalool (68.80%) and volatile oil content (4.86 mg g⁻¹). Thus, GCr-4 (Sorath Sugandha) was found promising for cultivation in Saurashtra and North Gujarat during the *Rabi* season.

Keywords: Coriander, GCr-4, seed yield, linalool, powdery mildew

1. Introduction

Coriander (*Coriandrum sativum* L.) is one of the most important seed spice crops cultivated in India valued for its aroma, flavour and medicinal properties. It is commonly known as a “Dhania” or “Dhana” and belongs to the family *Apiaceae*. The seeds and green leaves of the plant are consumed and added in the various dishes as garnishee due to their fragrance and colour (Kubo *et al.*, 2004) [6]. It is mainly cultivated in tropical regions and various countries like Morocco, Romania, Bulgaria, France, Spain, Italy, Netherland, Myanmar, Pakistan, Turkey, Mexico, Canada, Argentina, Australia and some regions in the U.K and the USA (Kant *et al.*, 2017) [5]. It is one of the important commercial seed spice crops of arid and semi-arid regions of country and grown with less inputs under limited irrigated conditions in Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Uttar Pradesh, Odisha and Assam (Msaada *et al.*, 2007) [9]. In the year 2024-25, it was grown in 1,39,475 ha in Gujarat which produced 2,06,655 MT with productivity of 1482 kg/ha (Anon., 2025). Apart from its culinary importance, Different parts of coriander plant have been reported to possess several health benefits and biological activities (Begnami *et al.*, 2010) [3]. Coriander possesses medicinal properties including digestive, antimicrobial and antioxidant activities which enhance its economic and therapeutic value (Laribi *et al.*, 2015) [8]. Traditionally, coriander has been used to treat gastrointestinal disorders such as anorexia, dyspepsia, flatulence, diarrhea, pain and vomiting (Usmanghani *et al.*, 1997) [11]. According to Ayurveda, the active constituents present in the plant effectively balances all three doshas *i.e.*, Vata (air), Pitta (digestion), and Kapha (Earth and Water) (Chaudhary *et al.*, 2020) [4]. The linalool is the main compound in the essential oil. In addition to its medicinal uses, coriander oil has antifungal, antibacterial and antioxidant properties and a pleasant characteristic aroma (Asgarpanah and Kazemivash, 2012) [2].

In recent years, the demand for coriander with superior seed yield and enhanced quality attributes has increased due to expanding domestic consumption and export opportunities. Quality in coriander is largely determined by volatile oil content and its major constituent linalool which imparts characteristic aroma and determines market price. However, productivity and quality of coriander in farmer's fields remain constrained due to the limited availability of high-yielding varieties with stable performance, early maturity and resistance

to major biotic stresses. Many existing varieties exhibit longer crop duration, susceptibility to diseases such as powdery mildew and pests like aphids resulting in yield losses and increased cost of cultivation (Kumawat *et al.*, 2021) [7]. Development of varieties with inherent resistance or tolerance to these stresses is considered an economical and eco-friendly approach to improve coriander productivity. Therefore, varietal improvement programs now emphasize the development of genotypes combining high yield potential, superior quality traits and resistance to major diseases and pests (Singh *et al.*, 2012) [10].

Gujarat has emerged as one of the major coriander growing states in India, with increasing area under cultivation due to favourable climatic conditions, availability of irrigation facilities and attractive market prices. To enhance coriander production in the state, there is a need to develop improved varieties suitable for diverse agro-climatic zones. The new coriander genotype GCr-4 (JCR-7) was developed through mass selection from local germplasm and evaluated across multiple locations in Gujarat. The present investigation was therefore undertaken to assess the yield performance, yield-attributing characters, quality parameters and reaction to major diseases and pests of Gujarat Coriander-4 under multi-location trials in comparison with standard check varieties.

2. Materials and Methods

2.1 Experimental Site and Duration

The genotype GCr-4 was evaluated under state-level varietal trials during the *Rabi* seasons from 2016-17 to 2021-22 at multiple research centres representing different agro-climatic zones of Gujarat, India. The trials were conducted at Junagadh (South Saurashtra zone), Jagudan and Deesa (North Gujarat zone), Navsari (South Gujarat zone) and Sanand (Middle Gujarat zone). The experiments were coordinated under the research programmes of Junagadh Agricultural University.

2.2 Experimental Material

The experimental material comprised a promising coriander genotype JCR-7, later proposed for release as Gujarat Coriander-4 (GCr-4; Sorath Sugandha). The genotype originated from a local collection during 2013-14 and was subsequently purified through mass selection. After preliminary evaluation as a germplasm line (JCR-7) during 2014-15 to 2015-16, the genotype was advanced for multi-location and multi-year testing. Two released coriander varieties GCr-2 and GCr-3 were used as standard check varieties for comparison.

2.3 Experimental Design and Crop Management

The field experiments were conducted in a randomized block design with suitable replications as per state varietal

testing protocols during the *Rabi* seasons at different locations. The coriander genotype GCr-4 (JCR-7) along with the check varieties GCr-2 and GCr-3 were evaluated under uniform agronomic conditions. Sowing was carried out between 30 October and 15 November using a row spacing of 30 cm and a seed rate of 15 kg ha⁻¹. A basal application of farmyard manure at 10 t ha⁻¹ was incorporated before sowing along with recommended fertilizer doses of nitrogen 20 kg ha⁻¹ and phosphorus 10 kg ha⁻¹ while no potassium was applied. Eight irrigations were applied during the crop growth period including one irrigation at sowing, one at six days after sowing and the remaining irrigations at 15 days interval. All other recommended cultural practices, including weeding and plant protection measures were followed uniformly across all locations to ensure optimum crop growth and reliable comparison among genotypes.

3. Results and Discussion

3.1 Seed Yield Performance of Coriander Variety

The seed yield performance of the proposed coriander variety GCr-4 was evaluated in comparison with the standard check varieties GCr-2 and GCr-3 under coordinated varietal trials conducted during the *Rabi* seasons from 2016 to 2021 at major research locations of Gujarat including Junagadh, Jagudan, Deesa, Navsari and Sanand. The results showed variation in seed yield across different years and locations; however, the proposed variety generally performed better than the check varieties. In the Preliminary Evaluation Trial during 2016 at Junagadh, GCr-4 recorded a seed yield of 2231 kg/ha which was 24.50 per cent higher than the check variety GCr-2. In the State Seed Variety Trial conducted in 2017 at the same location, the proposed variety produced 1935 kg/ha showing a 10.00 per cent increase over GCr-2. During the large Scale Variety Trials from 2018 to 2021, GCr-4 showed good adaptability across locations with higher yields in most trials. The mean seed yield recorded in 2019, 2020 and 2021 trials was 1640, 1450 and 1638 kg/ha, respectively, which was higher than the check varieties. The pooled analysis across years further indicated that GCr-4 recorded an overall mean yield of 2083 kg/ha compared to 1776 kg/ha of GCr-2, representing a 17.29 per cent yield advantage. Similarly, across thirteen trials the proposed variety produced 1624 kg/ha compared to 1496 kg/ha of GCr-3, showing an 8.56 per cent increase. Moreover, the variety appeared in the top non-significant group in 12 out of 15 trials indicating stable performance across environments. Overall, the results clearly demonstrate that GCr-4 possesses higher yield potential, better adaptability and greater stability than the existing check varieties and therefore can be considered a promising coriander variety for cultivation during the *Rabi* season in Gujarat.

Table 1: Seed yield of Coriander variety GCr-4 (JCR-7) in *Rabi* season in Gujarat state

Locations	Seed yield (kg/ha)			S.Em. ±	CD at 5%	CV %
	Proposed variety GCr-4	GCr-2 (SC) (a)	GCr-3 (SC) (b)			
2016 PET						
Junagadh	2231 ^a	1792	-	113.00	333.00	10.97
% Increase over check		24.50	-	-	-	-
2017 SSVT						
Junagadh	1935	1759	-	100.00	307.00	11.18
% Increase over check		10.00	-	-	-	-
2018 LSVT						

Junagadh	1938	-	1819	104.00	308.00	10.86
Jagudan#	340	-	756	8.86	26.00	18.95
Mean(1)	1938	-	1819	-	-	-
% Increase over check		-	6.54	-	-	-
2019 LSVT						
Junagadh	1954 ^b	-	1634	104.00	308.00	11.13
Jagudan	1522	-	1478	61.56	183.00	7.40
Deesa	1482 ^b	-	1148	74.88	222.00	10.46
Navsari	1683	-	1531	64.99	193.09	7.04
Mean(4)	1640	-	1448	-	-	-
% Increase over check		-	14.64	-	-	-
2020 LSVT						
Junagadh	1546 ^b	-	1247	68.00	201.00	9.10
Jagudan	1676 ^b	-	1520	12.88	38.40	15.17
Deesa#	639	-	809	65.03	193.00	17.25
Navsari	1127	-	1505	97.69	290.25	11.41
Sanand++	2702	-	3068	147.16	NS	9.00
Mean(3)	1450	-	1424	-	-	-
% Increase over check		-	1.83	-	-	-
2021 LSVT						
Junagadh	1370 ^b	-	1102	66.00	192.00	10.14
Jagudan	1197	-	1157	80.76	236.00	13.55
Deesa	1407 ^b	-	1056	92.70	271.0	10.05
Navsari	1952	-	2007	106.81	322.77	9.37
Sanand	2262	-	2244	121.67	355.13	9.14
Mean(5)	1638	-	1513			
% Increase over check		-	8.26		-	-
Overall Mean (2)	2083	1776	-	-	-	-
% Increase over check		17.29	-	-	-	-
Overall Mean (13)	1624	-	1496			
% Increase over check		-	8.56			
No. of Frequency in top NS group	12/15	0/2	9/13	-	-	-

++ Data from Sanand in 2020 was excluded from pooled analysis due to non-significant differences.

Significant at 5% level than checks; a= GCr-2 and b= GCr-3

=Data were not considered in calculation of mean due to below state average seed yield.



Fig 1: Field view of proposed GCr-4

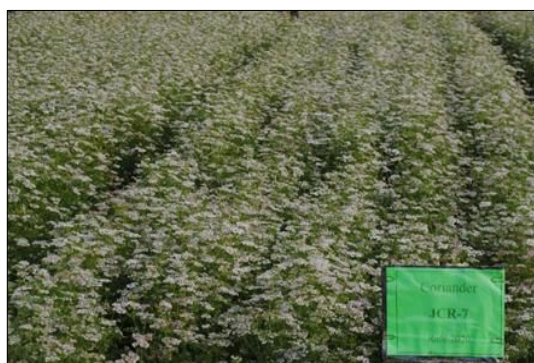


Fig 2: Experimental Layout



Fig 3: Seed of proposed variety GCr-4 with checks

3.2 Yield Attributing Characters of Coriander Variety

The data on yield-attributing characters indicated that the proposed variety GCr-4 performed better than the check varieties GCr-2 and GCr-3 for most of the traits. The mean plant height of GCr-4 was 85.45 cm which was comparable with the checks. The variety recorded earlier flowering (41.93 days) and earlier maturity (95 days) compared to GCr-2 and GCr-3. GCr-4 also produced higher number of primary branches (5.93), secondary branches (17.50), umbels per plant (14.48), umbellate per umbel (6.40) and seeds per umbellate (6.72). In addition, it recorded the highest 1000-seed weight (16.76 g) among the tested varieties. These results indicate the superiority of GCr-4 in terms of important yield-contributing traits.

Table 2: Mean and range of ancillary observations of GCr-4 recorded from 2016 to 2021 at Junagadh centre

SN	Ancillary observation		GCr-4	GCr-2	GCr-3
1	Plant height (cm)	Mean	85.45	84.15	89.91
		Range	63.37 - 89.0	79.23 - 84.85	56.70 - 90.87
2	Days to 50% flowering	Mean	41.93	49.83	54.89
		Range	39.00 - 44.67	49.67 - 50.0	52.67-56.0
3	Days to maturity	Mean	95.00	101.50	113.00
		Range	90.33 - 103.0	99.0-104	100.33-115.10
4	No. of primary branches/plant	Mean	5.93	5.15	5.90
		Range	2.37- 6.25	2.80-5.80	2.27-6.15
5	No. of secondary branches/plant	Mean	17.50	16.45	17.30
		Range	12.40-18.30	13.25-17.45	13.64-18.45
6	No. of umbels/plant	Mean	14.48	10.06	13.68
		Range	10.33-19.23	9.63-10.49	12.1-15.10
7	No. of umbellate/umbel	Mean	6.40	4.52	6.10
		Range	5.03-7.20	4.07-4.97	5.63-6.85
8	No. of seeds/umbellate	Mean	6.72	5.35	6.42
		Range	4.78 -7.03	4.6-5.80	5.30-6.53
9	1000 seeds weight (g)	Mean	16.76	10.35	10.82
		Range	15.9-17.20	10.16-10.85	9.70-14.40

3.3 Evaluation of Coriander Variety for Resistance to Powdery Mildew

The reaction of the proposed coriander variety GCr-4 to powdery mildew was evaluated during the *Rabi* seasons from 2019–20 to 2021–22 at Junagadh and compared with the check variety GCr-3. No disease incidence was observed in either variety during 2019–20 and 2020–21. In 2021–22, GCr-4 recorded 3.67% disease incidence, whereas the check variety recorded 9.50%. Both varieties were categorized as resistant (R) to powdery mildew. Overall, the disease incidence ranged from 0.00 to 3.67% in GCr-4 and 0.00 to 9.50% in GCr-3 indicating better resistance of GCr-4 under the agro-climatic conditions of Gujarat.

Table 3: Reaction to major diseases recorded from 2019-20 to 2021-22 at Junagadh Centre

Disease	Years	Incidence (%)			
		GCr-4		GCr-3 (LC)	
		A	B	A	B
Powdery Mildew Index (Junagadh)	2019-20	0.00	-	0.00	-
	2020-21	0.00	-	0.00	-
	2021-22	3.67	R	9.50	R
	Range	0.00-3.67	-	0.00-9.50	-

A= Incidence%; B= Reaction, I= Immune and R= Resistant

3.4 Evaluation of Coriander Variety for Resistance to Pest (Aphids)

The incidence of aphids was recorded for the proposed variety GCr-4 and compared with the check variety GCr-3 during the *Rabi* seasons from 2019–20 to 2021–22 at Junagadh. The proposed variety consistently recorded lower aphid population than the check. The mean aphid population in GCr-4 was 5.60, 4.36 and 3.86 aphids per plant during 2019–20, 2020–21 and 2021–22, respectively, whereas the check variety recorded 8.06, 6.30 and 5.43 aphids per plant in the respective years. The overall mean aphid population was 4.60 aphids per plant in GCr-4 compared to 6.60 aphids

per plant in GCr-3. These results indicate that GCr-4 is less susceptible to aphid infestation than the check variety.

Table 4: Reaction to major pest recorded from 2019-20 to 2021-22 at Junagadh Centre

Pest	Years	GCr-4	GCr-3 (SC)
Mean No. of Aphid/plant (Junagadh)	2019-20	5.60	8.06
	2020-21	4.36	6.30
	2021-22	3.86	5.43
	Mean	4.60	6.60
	Range	3.86-5.60	5.43-8.06

3.5 Evaluation of Quality Traits in Coriander Varieties

The quality parameters of the proposed coriander variety GCr-4 were compared with the check varieties GCr-2 and GCr-3. The results indicated that GCr-4 recorded higher linalool content (68.80%) compared to GCr-2 (62.52%) and GCr-3 (66.83%). Similarly, the volatile oil content was also higher in GCr-4 (4.86 mg/g) than in GCr-2 (4.12 mg/g) and GCr-3 (3.80 mg/g). These results indicate that GCr-4 possesses better quality attributes with higher linalool and volatile oil content compared to the check varieties.

Table 5: Quality Parameters

No.	Quality Parameters	GCr-4	GCr-2	GCr-3
1	Linalool content (%)	68.80	62.52	66.83
2	Volatile oil content (mg/gm)	4.86	4.12	3.80

4. Conclusion

The multi-location and multi-year evaluation showed that the coriander genotype GCr-4 (Sorath Sugandha) is superior to the check varieties GCr-2 and GCr-3 in yield, quality and tolerance to major stresses. It recorded consistently higher and stable seed yield with a 17.29% advantage over GCr-2 and 8.56% over GCr-3. The higher yield was mainly due to better yield attributes such as more branches, umbels per plant, seeds per umbellate and higher test weight along with relatively earlier flowering and maturity. The variety also showed lower incidence of powdery mildew and aphids along with higher linalool (68.80%) and volatile oil content (4.86 mg g⁻¹) indicating superior quality. Therefore, GCr-4 (Sorath Sugandha) is recommended for cultivation during the *Rabi* season in Saurashtra and North Gujarat to improve coriander productivity and quality.

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