

Gujarat Dantiwada leafy coriander 1- A new variety for vegetable purpose

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Abstract

Coriander (*Coriandrum sativum* L.) is one of the important seed spice crop, its aromatic leaves are used in culinary from ancient times in India and across the world. Limited varieties are available for harvesting high leaf yield. Punjab sugandh (PAU, Ludhiana) and Arka Isha (IIHR, Bangalore) are multi-cut varieties of coriander released for Punjab and Karnataka, respectively. All other dual purpose varieties viz., ACr-1 developed from NRCSS, Ajmer (Malhotra *et al.*, 2016), RCr784 (RAU, Bikaner), whereas, Hisar Anand; Hisar Sugandh (DH-36) developed from CCS Haryana Agricultural University, Hisar (Tehlan *et al.*, 2009) are for both seed and leaves purpose developed. There is no variety available for green leaf coriander in Gujarat. Hence, systematic efforts were made to develop vegetable coriander variety with higher green leaf yield, suitable for multiple cutting, lustrous leaves with pleasant aroma with better keeping quality and better seed yield at Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan. Total eleven trials were conducted at three different locations viz., Jagudan, Anand and Junagadh from year 2009-10 to 2013-14 in *rabi* season. The variety Gujarat Dantiwada Leafy Coriander 1 (GDLC1) produced 31.94 t ha⁻¹ average green leaf yield against 28.71 and 18.31 t ha⁻¹ of Punjab Sugandh and Gujarat Coriander 2 check variety, respectively. The yield potential of this variety is 44.76 t ha⁻¹ after two cutting whereas, in three cuttings, yielded 59.68 t ha⁻¹. The seed yield after two cuttings in GDLC 1 was 656 kg ha⁻¹; the seeds are of medium size with greenish brown colour. This variety had tall plant stature with more number of branches and had late bolting habit (70 days), as compared to Punjab Sugandh, which signifies faster regeneration growth. Leaves contain 132 mg 100 g⁻¹ of chlorophyll, 0.05 per cent essential oil having pleasant aroma, whereas, seeds of GDLC-1 have 0.40 per cent essential oil. Post-harvest studies indicated that the GDLC-1 variety can be stored up to 14 days in refrigerator in polythene bags (100PE Gauge). Considering above salient features, GDLC 1 is suited for commercial cultivation.

Key words : GDLC 1, green leaf yield, grain yield, leafy coriander

Introduction

Coriander (*Coriandrum sativum* L.) is one of the important leafy vegetables as well as seed spice crops having a pleasant aroma and taste. Green coriander, which is also called cilantro, Chinese parsley, Mexican parsley and Japanese parsley belongs to the family *Apiaceae*. It is diploid and has 2n = 22 chromosomes. India is the largest producer of coriander in the world. In India, Rajasthan, Madhya Pradesh, Andhra Pradesh, Tamil Nadu, Orissa, Uttar Pradesh and Uttaranchal are major coriander producing states. Coriander crop occupies second position after cumin amongst all seed spices in the country in terms of production. During the year 2015-16, country had produce 4.6 lakh tons from area 5.5 lakh ha (NHB, 2016). It is being cultivated in Gujarat in about 0.92 lakh hectares and production was 1.43 lakh tones (DOH, Gujarat, 2015). During 2014-15, India exported 46000 tonnes of coriander seed worth of ` 498.13 crores, foreign exchange earned by spices export. Mostly leafy coriander is grown as kitchen garden crop, hence area under cultivation is

very negligible, and however, field area under cultivation for leafy coriander may be estimated approximately 10000 ha.

The green herb is also consumed on a large scale in India, China, Thailand, Malaysia, Indonesia, the American Midwest and in the near East (Prakash, 1990). Coriander is flavorings spices and its stems, leaves and seeds are used in number of culinary preparation. The dry seeds are extensively used in form of powder, but flavor of fresh leaves is very much liked by the consumers in curries, sauces, soups and different culinary preparations and in India, it is very commonly used in chutneys (Ilyas, 1980). Coriander is a wonderful source of dietary fiber, manganese, iron and magnesium and leaves are rich in Vitamin C, Vitamin K and protein. The health benefits of coriander leaves are lowers bad cholesterol and increase the levels of good cholesterol. Coriander stimulate the insulin secretion and lower the blood sugar levels; hence good for diabetes patients. The fat soluble vitamin A is good for the eyes and prevents eye diseases and protects

from lung and cavity cancer. Coriander contains high amounts of iron, which is essential for curing anemia. Coriander leaves is also known as best cleaning treatment for kidneys. In India, twelve notified varieties are available including Punjab sugandh (Prajapati *et al.*, 2015). Whereas, In Gujarat, the two cultivars viz., GCo-1 and GCo-2 were recommended since long mainly for seed purpose. But there is no variety recommended for leafy purpose or as a multi-cut variety. Menon and Khader (1997) suggested that leaf plucking of coriander seed crop at early stages can provide an extra income to the growers.

Therefore, looking to the importance of leafy coriander and to overcome the issues of farmers and consumers the attempts were made to develop a coriander variety for high green leaf yield, multiple cutting, lustrous leaf with pleasant aroma vegetable coriander variety with better keeping quality and better Seed yield at Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan.

Materials and methods

More than 30 germplasm lines were collected from different areas of North Gujarat and Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan during 2006 and assessed for their regenerative capacity suitable for multiple cuttings each entry was selfed and these line were purified based on individual plant progeny during years 2007-08 and 2008-09. Local kalami which accession number 589 was identified from the germplasm maintained at SSRS, SDAU, Jagudan and named Gujarat Dantiwada Leafy Coriander 1. Ten promising entries were isolated viz., JCr-378, JCr-388, JCr-389, JCr-390, JCr-391, JCr-395, JCr-398, JCr-399, Local Kalami (GDLC-1) and Local Kalami (Raj) after comparing with Punjab Sugandh and Gujarat Coriander 2 (GCo-2) check variety in preliminary evaluation trial and small scale varietal trial during 2009-10 and 2010-11, respectively. Punjab Sugandh used as check for its multi-cut habit of release variety and GCo-2 as local check of variety conventionally used by coriander grower for dual purpose. All ten promising entries and two check varieties were tested in nine large scale trials at three different locations viz., Jagudan, Anand and Junagadh during 2011-12 to 2013-14 in large scale varietal trial in a randomized block design with three replications. The plot size was 3.00 m x 2.40 m with row to row spacing 30 cm. The recommended package of practices was followed during the course of investigation. Data on various morphological characters viz., plant height (cm), number of tillers plant⁻¹, leaf length (cm), length of longest basal leaf including petiole (cm), No. of leaflets, petiole length (cm), leaf length (cm), leaf width (cm), days to maturity, seed colour, days to 1st cutting, days to 2nd cutting, days to bolting and green leaf yield (t ha⁻¹) were recorded. The bio-chemical

parameters and post harvest studies have also been carried out. The chlorophyll content in the green coriander was estimated by Witham *et al.*, (1971). The data pertaining to various characters were analyzed as per the procedure of randomized block design given by Panse and Sukhatme (1978) for individual environments.

Results and discussion

Based on yield performance of local kalami (GDLC-1) exhibited significantly highest green leaf and better grain yield. Experimental results revealed that variety Gujarat Dantiwada Leafy Coriander-1 (GDLC-1) obtained 31.94 t ha⁻¹ green leaf against 28.71 and 18.31 t ha⁻¹ of Punjab Sugandh and GCo-2 as checks, respectively and out yielded both the check varieties in eleven trials out of eleven trials. It also significantly out yielded Punjab Sugandh and GCo-2 in six trials out of eleven trials and in ten trials out of eleven trials with 11.3 and 76.2 per cent higher leaf yield, respectively, indicating its superiority in yield over the years and locations. The yield potential of this variety is 44.76 t ha⁻¹ (Table 1), whereas, in three cuttings the GDLC-1 has yielded 59.68 t ha⁻¹ which was 10.2 and 123.0 % higher than Punjab Sugandh and GCo-2, respectively at Junagadh during 2011-12 (Table 2). Similarly, Punjab Sugandh is late in bolting and suited for multi-cutting, Dhatt and Sindhu (2008) has recorded 37.5 t ha⁻¹ average green coriander yield after four cuttings in Punjab Sugandha. Similarly, green coriander ACR-1 was useful for seed as well as leafy vegetable purpose and farmer can easily take one green leaf cutting from the variety without reducing the seed yield and can earn extra money throughout the year (Malhotra *et al.*, 2016). The ripe fruits of coriander are extensively used in form of powder, whereas, the seed yield recorded after two cutting of GDLC-1 (656 kg ha⁻¹) remained at par with Punjab Sugandh (700 kg ha⁻¹) which is a remunerative output for farmers (Table 2). The seeds are greenish brown colour, medium size having 0.40 per cent essential oil in ripe fruits. The seed maturity of GDLC-1 (134 days) was found to be at par with Punjab Sugandh (139 days) followed by GCo-2 (124 days) (Table 4).

The green leaf yield of GDLC-1 was obtained 31.94 t ha⁻¹ after two cuttings, at Junagadh during 2011-12 three cuttings gave green leaf yield of 59.68 t ha⁻¹. Hence, the variety was found suitable for multi-cut (Table 3). However, maximum up to four cutting can be taken. The plant height of GDLC-1 showed 30.4 cm and 29.3 cm followed by Punjab Sugandh (29.2 cm and 27.5 cm) and GCo-2 (30.3 cm and 29.0 cm) at first and second cutting, respectively. First and second cutting of GDLC-1 was taken at 53, 73 days followed by Punjab Sugandh (at 56, 75 days) and GCo-2 (at 49, 65 days) after sowing, respectively. The number of tillers plant⁻¹ at first and second cutting of GDLC-1 were 8.1, 8.2 followed by Punjab Sugandh (7.8, 8.0)

and GCo-2 (6.6, 7.1), respectively (Table 5).

The growth habit of the longest basal leaf of GDLC-1 is semi-erect; leaves are large with short leaf lobes and light green in colour. Leaves have 132 mgg⁻¹ of chlorophyll. The luster at lower surface of leaves is non waxy and shining. Essential oil content of leaves is 0.05% having pleasant aroma. It is a late bolting (70 days) variety, which is desirable character for better leaf yield (Table 4 and 5). Post-harvest studies indicate that the released variety can be stored maximum up to 14 days in refrigerator in polythene bags (100PE Gauge) as compared to Punjab Sugandh (12 days) and GCo-2 (10 days), respectively without losing its aroma and leaf luster. The sundry studies revealed higher dry matter of released variety (17.6%), which is 15.8% and 14.8% higher than Punjab Sugandh

and GCo-2, respectively (Table 5). Hence, dry leaves may be used in off season, consumers' preference obtained due to leaf colour, appearance, flavour and taste indicates its superior quality and better acceptance among the consumers than the check varieties. The description of variety GDLC-1 possesses more no. of leaflets with semi erect growth habit, leaf size is large with deep green colour and length of longest basal leaf including petiole (cm) than checks varieties mentioned in Table 6.

There was no occurrence of any pest and diseases during the course of investigation in any varieties at any location up to leafy stage, however aphid infestation and powdery mildew incidence at Jagudan was observed after that up to maturity which was lower in GDLC-1 variety than check during 2012-13 and 2013-14 (Table 7).

Table 1. Comparative marketable Green leaf yield performance of GDLC 1 at individual location and mean over the locations (two cuts).

Location	Name of experiment & year	Green Biomass yield (t ha ⁻¹)			% increase over		C.D. 5%	C.V. %
		GDLC-1 (Local Kalami)	P. Sugandh (ch)	Guj. Co-2 (ch)	P. Sugandh (ch)	Guj. Co-2 (ch)		
Jagudan	PET2009-10	30.02 ⁺	28.27	18.49	6.2	62.3	7.34	19.1
	SSVT2010-11	22.89	17.30	14.89	26.3	50.3	N.S.	19.8
	LSVT2011-12	28.11 ⁺	26.43	15.31	6.4	83.6	6.45	17.1
	LSVT2012-13	26.96 ^{*+}	24.06	16.67	12.0	61.8	2.54	7.9
	LSVT2013-14	33.42 ^{*+}	31.00	18.67	7.8	79.0	4.15	9.7
	Pooled Mean	28.18 ⁺	25.50	16.81	10.5	67.7	3.01	15.46
Anand	LSVT2011-12	25.56 ^{*+}	23.16	17.86	10.3	43.1	2.08	6.3
	LSVT2012-13	26.39 ⁺	21.28	19.00	24.0	38.9	3.61	10.4
	LSVT2013-14	29.17 ⁺	27.22	19.78	7.1	47.5	4.04	11.0
	Pooled Mean	27.04 ⁺	23.89	18.88	13.2	43.2	3.03	9.46
Junagadh	LSVT2011-12	44.76 ⁺	39.60	18.40	13.0	143.2	4.84	9.0
	LSVT2012-13	39.78 ⁺	34.78	15.50	15.0	157.9	5.15	13.0
	LSVT2013-14	37.11 ⁺	35.83	22.22	3.6	67.0	5.82	12.7
	Pooled Mean	40.62 ⁺	36.74	18.71	10.6	117.1	6.67	12.35
Over all Mean (11 trials)		31.94	28.71	18.13	11.3	76.2		
Significant superiority over check			6/11	10/11				

Note: * and + indicate that the proposed variety GDLC-1 significantly superior to the respective check P. Sugandh and Guj.Co.2 in green leaf yield

Table 2. Comparative grain yield performance of GDLC 1 at Jagudan after two cuttings.

Location	Name of experiment / year	Grain yield (kg ha ⁻¹)			% increase over		C.D. 5%	C.V. %
		GDLC 1 (Local Kalami)	P.Sugandh (ch)	Guj.Cor.2 (ch)	P.Sugandh (ch)	Guj.Cor.2 (ch)		
Jagudan	PET2009-10	410	511	121	-	239.4	182	42.5
	SSVT2010-11	1394	1417	1304	-	6.9	467	19.3
	LSVT2011-12	400	583	200	-	200.0	230	34.2
	LSVT2012-13	421	290	362	46.2	16.3	NS	21.5
	Mean	656	700	497	-	32.0		

Table 3. Comparative marketable green leaf yield performance of GDLC 1 after three cutting at Junagadh (2011-12)

Genotype	two cutting (t ha ⁻¹)			three cutting(t ha ⁻¹)		
	Green leaf yield	% increase over		Green leaf yield	% increase over	
		P.Sugandh	Guj.Cor.2		P.Sugandh	Guj.Cor.-2
GDLC-1	44.76	13.0	143.2	59.68	10.2	123.0
P.Sugandh (ch)	39.60	-	-	54.13	-	-
Guj.Co. 2 (ch)	18.40	-	-	26.76	-	-

Table 4. Plant height (cm), tillers plant⁻¹, days to cutting, bolting and seed maturity

Genotype	1 st cutting*			2 nd cuttings*			Days to bolting	Days to Seed maturity
	plant height	tillers plant ⁻¹	days to cutting	plant height	tillers plant ⁻¹	days to cutting		
GDLC-1	30.4	8.1	53	29.3	8.2	73	70	134
P.Sugandh (ch)	29.2	7.8	56	27.5	8.0	75	72	139
Guj.Co.2 (ch)	30.3	6.6	49	29.0	7.1	65	47	124

*Mean of Jagudan (5 year), Anand (2 year) and Junagadh (2 year).

Table 5. Bio-chemical parameters and post-harvest study

Genotype	Moisture (%)	Dry matter (%)	Total chlorophyll (mg g ⁻¹)	Volatile Oil %		Storability in refrigerator (days)
				Green	Seed	
GDLC-1	82.4	17.6	1.32	0.050	0.40	14
P. Sugandh (ch)	84.2	15.8	1.27	0.045	0.35	12
Guj.Co. 2 (ch)	85.2	14.8	1.20	0.047	0.45	10

Table 6. Description of variety

Description of variety	GDLC-1	P. Sugandh (ch)	Guj.Cor.2 (ch)
Length of longest basal leaf including petiole (cm)	37.7	36.7	24.3
No. of leaflets	8.0	7.2	7.0
Petiole length(cm)	16.3	17.2	10.5
Leaf length (cm)	6.4	6.6	6.0
Leaf width (cm)	4.7	4.6	4.2
Days to maturity	134	139	124
1000 seeds wt.(g)	8.005	8.535	10.707
Seed Colour	Greenish brown	Brown	Brown

Table 7. Reaction to major pest and diseases at the time of seed maturity at Jagudan.

Disease/pest infection		GDLC 1	P. Sugandh	G.Co.2
		Aphid Index (0-4 scale)		
Pest	2012-13	0.6	0.8	1.00
	2013-14	0.4	0.87	0.87
	Average	0.50	0.84	0.94
		Powdery Mildew (PDI)		
Diseases	2012-13	9.50	10.25	14.50
	2013-14	8.25	8.75	12.25
	Average	8.88	9.50	13.38

Conclusion

In Gujarat, two cultivars viz., GCo-1 and GCo-2 were recommended in 1974 and 1984, respectively for spice purpose; So far, variety GDLC-1 will be best suited for green leaf production for green leaf yield and seed yield having excellent quality, erect growth habit, bears good flavor in Gujarat. GDLC-1 is recommend as first improved leafy coriander multi-cut variety having potential under varying environmental conditions of Gujarat for general cultivation in the vegetable growing areas of the state. Recently State Variety Release Committee (SSVC, 2014) vides notification no. IST-102015-114-K-6 dt.14.8.15 of 45th Sub-Committee meeting has approved release of the variety and has sent recommendation to Central Varietal Release Committee for notification. At present climate change may be a challenging factor to agriculture due to increasing temperature and found to be major limiting factor for germination and growth of coriander responsible for delayed germination. Thus, GDLC-1 variety is suited for commercial cultivation for small and marginal farmers and can be utilized in kitchen gardening also.

References

- Anonymous, 2016. Indian Horticulture Data base, 2016. N.H.B., Government of India. pp. 246.
- Anonymous, 2015. District-wise area and production of Horticultural crops, 2015. Directorate of Horticulture, Gujarat State, Gandhinagar.
- Dhatt, A. S. and Sindhu, A. S. 2008. Punjab Sugandham: A multi-cut variety of green Coriander (*Coriandrum Sativum* L.). Proceedings of the National Seminar on Recent trend in research on spices and aromatic plants, Hisar, India.
- Hundal, S. S. 2004. Climatic changes and their impact on crop productivity vis-a-vis mitigation and adaptation strategies. Proceedings of the Workshop on Sustainable Agricultural Problems and Prospects, (SAPP'04), Punjab Agricultural University, Ludhiana, India, pp: 148-153.
- Ilyas, M. 1980. Spices in India. Econ. Bot. 34:236-259.
- Malhotra, S. K., Kakani R. K., Sharma, Y. K. and Singh, D. K. 2016. Ajmer Coriander-1 (NRCSS, ACR-1) resistant to stem gall disease-An innovative farming technology. *Indian J. Areca nut, Spices and Medicinal Plants* Vol.18 (3) 2015, pp 3-7.
- Marcellos, H. and Single, W. V. 1972. The influence of cultivar, temperature and photoperiod on post-flowering development of wheat. *Aust. J. Agric. Res.*, 23: 533-540.
- Menon, R. and Khader, M. A. 1997. Effect of leaf plucking on the growth and grain yield of coriander. *Indian Cocoa Arecanut Spices J.*, 21:74-75.
- Panse, V. G. and Sukhatme, P. V. 1978. Statistical methods for agricultural workers (III Edn.). I.C.A.R. Publication, New Delhi.
- Prajapati, D. B., Patel, D. G. and Amin, A. U. 2015. Seed quality disease and quarantine (edited book) published by Avishkar distributor, Jaipur. pp: 156-165.
- Prakash, V. 1990. Leafy Spices. Boca Raton (USA): CRC Press Inc. Singh, D., G.R. Chaudhary, S. Singh and D. L. Singhanian. Production technology for seed spices, pp.31-32
- Sarada, C. K., Yellaman Giridhar, R. and Venkatareddy, P. 2011. Weather modification for off season production of coriander (*Coriandrum sativum* L.) for leaf, *J. Agric. Meteorol.*, 13: 54-57.
- State Variety Release Committee (2014). Proceedings of the 45th State Variety Release Committee held on 22nd May, 2014, item (39) at Gandhinagar, Gujarat, India
- Tehlan, S. K., Thakral, K. K., Partap, P. S. Hisar Sugandh: a high yielding variety of coriander. CCS Haryana Agricultural University, Hisar. *Haryana J. Horticultural Sciences*, 2009, Vol.38 No.1/2 pp.106-107 ref.4
- Witham, F. H., Blaydes, D. F. and Devlin, R. M. 1971. Experiments in Plant Physiology. Van Nostrand Reinhold Co., New York. pp.55-58.

Received : August 2016; Revised : November 2016;
Accepted : Decebmer 2016.