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Ajmer Green Coriander-1 (AGCr-1): a leafy variety of coriander for off season cultivation

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Abstract

Ajmer Green Coriander-1 (AGCr-1) variety of coriander has been released for leafy purpose and powdery mildew resistance for off season cultivation in Rajasthan state. The average yield of green leaves was 2732.89 kg/ha under shade net conditions. This variety has powdery mildew resistance with percent disease score of 21.69 %. The essential oil content of leaves and seeds was observed 0.0 5% and 0.36 %, respectively. The variety was recommended for release in Institute Research Advisory (IRC) Committee Meeting held at ICAR-National Research Centre on Seed Spices, Ajmer and submitted State Seed Sub-Committee, Govt. of Rajasthan and notified vide S.O. No./1480 (E); dated 01.04.2021 for commercial cultivation under timely sown, with recommended POP for growing areas of Rajasthan. In off-season, coriander growers will be able to grow AGCr-1 to accomplish market demand and improve their farm productivity and income.

Keywords: AGCr-1, Higher Green Leaf Yield, Essential oil, Moderately Resistant to Powdery Mildew

Introduction

Coriander (*Coriandrum sativum* L.) is also known as 'Dhania' or Chinese Parsley, an important, cross pollinated in nature (Meena *et al.*, 2015) and earliest known crop of seed spices. It's an annual herb, belongs to family Apiaceae. This species has chromosome numbers $2n = 22$ (Baijal and Kaul, 1973). It is originated from Southern Europe and Northern America to South-western Asia (Meena and Meena, 2020). Its cultivation widely spreading in many countries of the world including India, Russia, Iran, China, Syria, Bulgaria, Morocco, Egypt, Turkey, Mexico, Canada, Italy and Afghanistan. In India, it is mainly cultivated in the arid and semi-arid territories of Rajasthan, M.P., Gujarat and Andhra Pradesh (Lal *et al.*, 2012 and Meena *et al.*, 2016). Currently, India is producing 735.28 thousand tonnes of coriander seed from 553.10 thousand hectares area with an annual productivity of 1329 kg/ha. The country also exported 108624 metric tonnes of seed and earned Rs. 94820.97 lakhs during 2023-24. The stems,

leaves, and fruits have a pleasing aromatic odour. All parts of the plant are edible and used in diverse way throughout the world. The plant contains high amount of ascorbic acid (up to 160 mg/100 gm) (Prakash, 1990). The coriander leaves are used as appetizer in preparing fresh chutneys and sauces and to flavour food dishes, curries, soups and sauce, etc. There is a regular demand of coriander's green leaves throughout the year and especially in off season, the price of green leaves is very high in the market due to low production and supply. The characteristic smell of the green plant is caused by the aldehydic contents of the essential oil. These chemical compounds decrease during ripening stage and after ripening and drying, they are no longer found in the fruits (Lorincz and Tyihak, 1965). Seeds are also used in preparation of various medicines (Sharma and Sharma, 2004). Coriander crop is highly sensitive to the unexpected variations in climatic parameters as it is delicate in the nature. Therefore, off season (summer) crop in ambient temperature is prone to affect negatively by high temperature, loss in quantity as well as quality. Coriander grows well at a temperature range between 20 – 25 °C. Germination of coriander is severely affected at temperature above 30°C and below 10°C. Heavy rains are harmful for the crop and continuous cloudy weather invites diseases and aphids. The temperature above 30°C to 35°C is required for seed maturation and harvesting. Frost especially during flowering and fruit setting stage is negatively affecting the quality production. In India, coriander is mainly grown for seed purpose; however leaf is also taken during cropping season for improving test and flavour in vegetable and garnishing in other dishes. During off season (summers), the market demand of leafy coriander is more due to consumer preference and non-availability of leafy variety in the country. The higher temperature >45°C, hot winds A number abiotic stresses i.e. the higher temperature >45°C, hot winds, intensive sunlight etc., play a crucial role in minimization of quality leaf yield. Similarly, few biotic stresses like root rot, powdery mildew, wilting, mites and thrips as well as and less availability of irrigation water are the major challenges in quality production. Moreover, production of leafy coriander having optimal essential oil and aroma during summers season is challenging. ICAR-National Research Centre

on Seed Spices has a good collection of genetic material (635 coriander germplasm lines) in its repository having wide range of characteristics for yield, quality and resistant source for different biotic stresses. To address above issue, a breeding programme was devised for the development of a leafy purpose coriander variety having quality leaf yield in summer season.

Material and methods

Evaluation and testing of advance coriander lines

Station trials were conducted at the Research Farm of ICAR-National Research Centre on Seed Spices, Ajmer during winter as well as summer season for four years 2014-15 to 2017-18 to evaluated coriander genotypes for leaf yield, quality and powdery mildew disease resistance. The trials were laid out in randomized block division (RBD) keeping standard crop geometry: the line to line and plant to plant distance of 25 x 7.5 cm was kept during winter and 25 x 5 cm during summer (off season). The experimental site is located between 74° 36' 01" E longitude and 26° 22' 31" N latitude at an altitude of 486 m above mean sea level (Meena et al., 2019). The soil of experimental plots was sandy loam in texture, pH 7.2, EC 0.3, well drained, low in organic carbon and available nitrogen, medium in available phosphorus and potash content. Experimental field was prepared by ploughing with disc harrow and 5-10 tonnes per hectare well decomposed FYM added. The crop was fertilized with different level of fertilizer doses. Observations for ancillary data on 50% flowering, plant height (cm), leaf length (cm.), No. of basal leaves per plant, length of longest basal leaf/plant (cm.), leaflet/ plant, fresh wt. leaves (g/plant) and leaf yield (kg/ha) were recorded by adopting standard procedure. Advanced genotypes were selected and further evaluated under at nine different locations [NRCSS, Ajmer, and farmer's field at Nadi-II, Mashinya, Nadi-I, Dang-I and Dang-II in Ajmer district] for three consecutive years 2014-15, 2015-16, and 2016-17. Yearly cumulative data of all nine locations were presented in Institute Research Council Meeting (IRC) for performance of the genotypes. The data were analysed following standard statistical procedures using statistical software OPSTAT developed by Chaudhary Charan Singh Haryana Agricultural University, Hisar. The essential oil was extracted from

30g dried coriander seed using hydro-distillation method.

Pedigree: Coriander variety AGCr-1 has been developed from the germplasm material VDA-GL-174 collected from Himachal Pradesh. Recurrent selection of breeding method was adopted. This variety was tested and validated at institute farm as well as farmers field using codes JSS-R-50, JBT-38/94, AGCr-1, IC-771744, and ACr-1. Based on its performance over the years and locations, the advanced entry AGCr-1 has been recommended for release in the Institute Research Council (IRC) Meeting. Subsequently, advanced entry AGCr-1 was released and notified as variety in the name of Ajmer Green Coriander-1 by State Variety Release Committee for Rajasthan State and submitted to the State Seed Sub-Committee, Govt. of Rajasthan, Jaipur on Crop Standards Notification and Release of Varieties for Horticultural Crops, Ministry of Agriculture, Department of Agriculture and Co-operation, Government of India, New Delhi vide Gazette Notification S.O. No./1480 (E); dated 01.04.2021.

Results and Discussion

Varietal description

Plants are annual herb, semi-erect, branched, dense leaf foliage, plant height is 21.39 cm. The other distinguishing morphological characteristics are high longest basal leaves, leaf colour is green, luster of longest basal leaf dull green shiny, habitus of basal leaves spread, involucre is present, umbellets per umbel is high. Variety fall in late group of maturity, takes 50-60 days for leaf yield. The variety shows moderately resistance against powdery mildew disease and this variety was less infested with aphids as compared to other released variety as observed in the field. The ancillary for necessary characteristics of proposed variety tested in station trials during 2014-15 to 2017-18 is presented in table 1.

Yield performance

Station and farmers field trials

Initial evaluation (station) trials were conducted at research farm of ICAR- National Research Centre on Seed Spices, Ajmer (Rajasthan) during 2014-15 to 2017-18, wherein proposed coriander variety AGCr-1 performed best over rest of the entries/germplasm lines, produced 2960.47, 2834.81, 2429.63 and

2706.67 kg per hectare green leaf yield in 2014-15, 2015-16, 2016-17 and 2017-18, respectively (Table 2). The advanced entry AGCr-1 recorded 29.78 per cent increased leaf yield over check variety ACr-1.

Performance of AGCr-1 under shade net conditions

Leaf Yield Attributes

Field trials were conducted under shade net conditions in off season (summer) to find out the performance of coriander lines for seed germination, plant height and flowering during four years 2014-15 to 2017-18 and pooled data is presented in Table 3. Data showed that the proposed entry AGCr-1 initiated seed germination at 6.83 days after sowing which was lowest among tested entries/ varieties (check) and completed entire germination in 12.65 days after sowing which was slightly higher time taken over the check entry (ACr-1). Similarly, the other parameters initiation of flowering, 50% flowering, plant height at harvest and 1st and 2nd leaf length were also found better over other entries.

Green Leaf Yield and Attributing Characters

The performance of coriander lines for green leaf yield and yield attributing characteristics were also evaluated by conducting experimental trials for four consecutive years of 2014-15, 2015-16, 2016-17 and 2017-18 under shade net conditions during off season and relevant data presented in table 4. It showed that the coriander entry AGCr-1 produced maximum number of basal leaves/plant (10.48) over other test entries/varieties, however, it was equal to the entry IC-771744. The other attributing characters i.e. length of longest basal leaf/plant, leaflet/plant, fresh weight of leaves (g/plant) and leaf yield (kg/ha) i.e. 18.18 cm, 7.47 Nos., 3.18 g/plant and 2732.89 kg/ha, respectively recorded higher in AGCr-1 over rest of the entries/variety (Table 4)

Quality Performance

The essential oil content in the variety was considered as quality parameter for leaf fragrance for the release, henceforth, essential oil was extracted from the green leaves and dried seed of coriander every year using hydro-distillation method. Three years of cumulative data on essential oil are presented in Table 5, revealed that the proposed advanced entry AGCr-1 contained 0.05% essential oil in green leaves and 0.36% in dried seed, which was 66.67% higher in green leaves and

20% in dried seeds than check variety ACr-1 (0.03% in green leaves and 0.30% in dried seed).

Compounds of essential oil

The major constituent of essential oil in coriander leaf of entry AGCr-1 is given in Table 6. Alpha pinene (16.01%), Myrcene (6.68) and Geranyl acetate (9.06) were present in higher amounts in green leaves of AGCr-1 compared to check ACr-1. Moreover, these three compound were also found in lower level in dried seeds of ACr-1.

Tolerance to disease resistance

The new variety Ajmer Green Coriander-1 (AGCr-1) possess moderately resistance to powdery mildew disease, which is a major problem during off season cultivation of coriander under shade net as well as open field conditions and causes severe yield loss coriander leaves in quality and quantity. Percent disease index (PDI) showed that AGCr-1 received lower disease incidence as compared to check variety ACr-1 (Table 7). Based on two years pooled data, 21.69% PDI recorded in proposed variety against 28.13% PDI recorded on check ACr-1.

Table 1: Mean of Ancillary data for the proposed variety tested in station trial during 2014-15 to 2017-18.

Characters	Entries	
	AGCr-1	ACr-1 (Check)
50% flowering (DAS)	64.3	50.94
Initiation of flowering (DAS)	53.69	41.97
Plant height (cm)	21.39	16.26
I st leaf length (cm.)	16.16	11.80
II nd leaf length (cm.)	15.11	10.77
No. of Basal leaves/plant	11.7	8.28
Length of longest basal leaf/plant (cm.)	18.01	14.49
Leaflet/ plant	7.32	6.20
Total Leaf/plant	27.0	17.67
Fresh wt. leaves (g/ plant)	2.92	1.44
Fresh plant yield(g/ plot)	1377.61	637.86
Yield kg/ha	7432.43	5726.62

Table 2: Green leaf yield (kg/ha) of coriander varieties in station and farmers field trials at different locations.

Year	Trial/Location	AGCr-1	ACr-1 (Check)	Farmers local material (Check)
2014-15	NRCSS, Ajmer	2960.47	1660.23	-
2015-16		2834.81	2246.67	-
2016-17		2429.63	1708.15	-
2017-18		2706.67	1994.07	-
2014-15	NRCSS, Ajmer	4590	2920	-
2015-16		13340	9638	-
2014-15	Nadi-II	11490	-	9586
2015-16		8620	-	5892
2014-15	Mashinya	7380	-	5779
2015-16		7020	-	5569
2016-17	Nadi-I	8140	-	6689
2016-17	Dang-I	15400	-	13373
2016-17	Dang-II	9710	-	7391
Mean		7432.43	5726.62	
% increase over check ACr-1	29.78			

Table 3: Performance of coriander line in shade net under off season for germination, plant height and flowering (Pooled data 2014-15, 2015-16, 2016-17 and 2017-18)

Treatment	Initiation Germination (DAS)	Complete Germination (DAS)	Initiation of flowering (DAS)	50% flowering (DAS)	Plant height at harvest	I st leaf length (cm)	II nd leaf length (cm)
JSS-R-50	11.73	15.19	49.88	57.00	14.84	11.04	9.58
JBT- 38/94	10.54	13.69	36.58	46.52	16.22	12.65	11.35
AGCr-1	6.83	12.65	52.58	65.10	21.80	17.03	15.95
IC-771744	8.40	12.65	52.58	58.88	20.13	14.96	13.74
ACr-1	7.81	11.58	42.90	51.71	16.90	12.70	11.72
SEm ±	0.23	0.26	1.01	1.19	0.39	0.36	0.31
CD (0.05)	0.65	0.75	2.91	3.43	1.13	1.05	0.89
CV (%)	8.60	7.10	7.40	7.40	7.59	9.23	8.59

*DAS: Days after sowing

Table 4: Performance of coriander line in shade net for green leaf yield and yield attributing characters (Pooled data 2014-15, 2015-16, 2016-17 and 2017-18)

Treatment	No. of Basal leaves/plant	Length of longest basal leaf/plant (cm)	Leaflet/plant	Fresh wt. leaves (g/ plant)	Fresh plant yield (g/ plot)	Yield kg/ha
JSS-R-50	7.41	12.48	5.49	2.15	560.13	1567.97
JBT- 38/94	7.37	14.06	5.92	2.31	643.63	1580.82
AGCr-1	10.48	18.18	7.47	3.18	1185.46	2732.89
IC-771744	10.48	17.50	7.22	2.50	996.65	2289.14
ACr-1	8.47	14.48	6.32	1.63	590.56	1652.28
Sem ±	0.19	0.36	0.12	0.06	26.52	57.18
CD (0.05)	0.55	1.04	0.34	0.18	76.39	164.70
CV (%)	7.25	8.18	6.23	9.34	11.55	10.08

Table 5: Essential oil (%) content in leaf of the proposed variety tested at NRCSS, station trial Ajmer during 2014-15 to 2016-17

S No.	Name of entries	Green Leaf		Seed	
		Essential oil %	% higher than ACr-1	Essential oil %	% higher than ACr-1
1.	AGCr-1	0.05	66.67	0.36	20.0
2.	ACr-1 (Check)	0.03		0.30	

Table 6: Profiling of leaf essential oil of the proposed variety tested at NRCSS, Ajmer in during 2014-15

Compound in essential oil	Leaf		Seed	
	AGCr-1	ACr-1	AGCr-1	ACr-1
Alpha pinene %	16.01	14.91	8.91	7.76
Myrecene %	6.68	2.18	0.37	0.34
Geranyl acetate	9.06	8.14	6.62	6.60

Table 7: Performance of proposed genotypes for Powdery mildew disease reaction in Station trials at NRCSS Ajmer during 2014-15 to 2015-16

S No.	Name of entries	2014 -15	2015 -16	Mean
1.	AGCr -1 (Proposed entry)	37.50	5.87	21.69
2.	ACr -1	47.93	8.33	28.13

Conflicts of Interest : The authors declare no conflicts of interest.

Reference

- Baijal, S.K. and Kaul, B.K. 1973. Karyomorphological studies in *Coriandrum sativum* and *Cuminum cyminum*. *Cytologia*, 38, 211-217.
- Kapas, A. 2011. The kinetic of essential oil separation from fennel by microwave assisted hydro-distillation (MWHD). *UPB Scientific Bulletin, Series B*, 73, 113– 120 (2011).
- Lal, G., Vashisth, T., Mehta, R.S. and Ali, S.F. 2012. Studies on different organic modules for yield and quality of coriander (*Coriandrum sativum* L.). *Int. J Seed Spices*, 2(1):1-6.
- Lorincz, K. and Tyihak, E. 1965. Untersuchungen über die Terpenkomponenten im Verlaufe der Ontogenie des Korianders (*Coriandrum sativum* L.) [in Russ., Germ. abstr., Hung. abstr.]. *Herba Hung*, 4:191-208.
- Meena, N.K. and Meena, R.S. 2020. Pest problem in coriander (*Coriandrum sativum* L.) cultivation and their management for quality production-A review. *J Plant Health*, 1(3):69-74.
- Meena, N.K., Lal, G., Meena, S.S., Kant, K., Meena, R.D., 2019. Screening of coriander varieties/entries for their relative susceptibility against aphids under field conditions. *J. Hort. Sci.*, 14:39-43.
- Meena, N.K., Singh, B., Kant, K., Meena, R.D. and R. K. Solanki 2015. Role of insect pollinators in pollination of seed spices-A review. *Int. J Seed Spices*, 5(1):1-17.
- Meena, N.K., Singh, B., Lal, G., Kant, K., Meena, R.D., 2016. Sustainable management of aphid in coriander (*Coriandrum sativum* L.) through botanicals and bio-pesticides. *Int. J. Seed Spices.*, 6(1):25-31.
- Prakash, V., 1990. Leafy Spices a book published by Boca Raton (USA): CRC Press Inc., pp 114.
- Sharma, M.M. and Sharma, R.K., 2004. Coriander. In: Handbook of Herbs and Spices, Vol. 2 (Ed. Peter, K. V.). Woodhead Publisher, Abington Hall, Abington Cambridge CBI6AH, England, pp. 145-161.