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# Evaluation of coriander varieties for green leaf yield in off season under shade net condition

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## Abstract

A field investigation was conducted in off (summer) season at ICAR-National Research Centre on Seed Spices, Ajmer (Rajasthan) during 2014-2017 to evaluate some coriander varieties for green leaf under shade net condition. There were five varieties tested under the off season viz., JSS-R-50, JBT- 38/94, AGCr-1, IC-771744 and ACr-1. The experiment was conducted in RBD with three replications. AGCr-1 is a leafy type variety suitable for dual purpose (leaves and seed production). Seeds are small in size and good quality. Green leaf is having high essential oil with good aroma and flavour. The nutritional requirement of the crop was fulfilled as per recommended doses of NPK (60:45:30 kg $ha^{-1}$) through urea, DAP and MOP. The results revealed that AGCr-1 variety performed best in off season condition among the tested varieties. This variety found promising under off season and exhibited highest growth, yield and yield parameters. The parameters like minimum (6.83 days) days to germination, maximum plant height at harvest (21.80 cm), maximum first leaf length (17.03 cm), maximum second leaf length (15.95 cm), highest number of basal leaf $plant^{-1}$ (10.48), length of longest basal leaf $plant^{-1}$ (18.18 cm.), leaflet $plant^{-1}$ (7.47), initiation of flowering (52.58 DAS), 50% flowering (65.10 DAS) and fresh weight leaves (3.18 g $plant^{-1}$) was recorded in AGCr-1. The maximum green leaf yield was recorded in AGCr-1 (2732.89 kg $ha^{-1}$) followed by IC-771744 (2289.14 kg $ha^{-1}$) and ACr-1 (1652.28 kg $ha^{-1}$). It was concluded that, there is good scope of coriander cultivation for green leaf production. Hence, AGCr-1 variety is recommended to grow in off season for green leaf production and higher income under shade.

**Key words:** Coriander, green leaf yield, off season, shade net, varieties.

## Introduction

Coriander (*Coriandrum sativum* L.) is an annual herb belongs to Apiaceae family and have chromosome number 2n=22. It is one of the important seed spices occupying a prime position throughout the globe to add taste, flavour and pungency in various food items. Green leaf is having high essential oil with good aroma and flavour (Lal *et al.*, 2016). Mostly leafy coriander is grown as kitchen garden crop, hence area under cultivation is very negligible, however, field area under cultivation for leafy coriander may be estimated approximately 10,000 ha (Spice Board India; 2014-15; Prajapati *et al.*, 2017). Besides the leader in the coriander production, India is importing about 45000 tons of coriander annually which worth of more than ₹ 200 crore. It was observed that this seed mostly import from European countries and used for coriander green leaf production. Screening of leafy type varieties in the country may reduce the import consequently can same the important foreign exchanged vis a visa growers can also fetch high price in off season.

Tender leafy shoots and seeds of coriander are used in the form of spices. But excessive shoot growth reduces quality and yield due to antagonism from leaf produced assimilates (Cowan *et al.*, 2001). Coriander plants are highly sensitive to the abrupt variations in climatic parameters as it is delicate in nature. Therefore, off (summer) season crop in ambient temperature is prone to affect negatively by high temperature, loss in quantity as well as quality of this valuable crop to a limit of 100% could be there. In extreme climates or at high temperature during the months of April to July the crop cannot survive in open conditions. By growing under protected structures/ shade nets, this crop can be produced easily for the green leaf purpose and one can fetch more income. It is well known that extreme climate especially high temperature in summer season is not conducive for the growth and development of coriander plant resulting into very less or sometimes no yield (Lal e*t al.*, 2016). Under open field condition, it is very difficult to grow vegetables successfully in the summer season due to very high incidence of biotic and abiotic factors. By adopting low-cost protected technologies like net house and shade net house are highly suitable for successful



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cultivation of common and high value vegetables during summer season (Singh *et al.*, 2010).

Farmers in the plain areas usually sown coriander seeds in normal season, resulting in price reduction due to enormous production and delivery of green leaves in the market. Therefore, the farmers try off-season production to combat the existing problem. However, poor vegetative growth, reduced plant height and premature bolting under high temperature condition reduce the green leaf yield and its quality drastically (Chaulagain *et al.*, 2011). At present limited varieties are available in off season leaf production so far as the most of the available verities bolt within 50 days. Hence, delayed flowering with high biomass and aroma was the key to develop the coriander variety for off season production for leafy purpose. Hence, screening of coriander varieties in off season for leaf production is very much needed. Therefore present study was conducted to screen out the best suited variety for off season and boost the green leaf yield to maximize the farmer's economy.

## Material and methods

The field experiment on performance study of coriander varieties in off season for green leaf production was conducted at ICAR-NRCSS, Ajmer (Rajasthan) during four consecutive seasons of 2014 to 2017. The soil of the experimental site was sandy loam with 8.2 pH. The experiment was laid out in randomized block design with three replications and five different varieties of coriander viz., JSS-R-50, JBT- 38/94, AGCr-1, IC-771744 and ACr-1. Sowing of coriander was done using recommend seed rate as per treatments at 15 cm line to line spacing. Light irrigation was applied immediately after sowing for ensuring proper germination and establishment of the crop. Afterward irrigation was applied for 5 to 10 days interval according to soil type and environmental condition. 50% of total nitrogen and full dose of phosphorus and potash in the experiment was provided at the time of sowing and remaining half nitrogen was divided in two equal splits and applied at 30 and 45 DAS, respectively. Five plants were selected randomly from each plot. Observations on plant height at harvest, first leaf length, second leaf length, number of basal leaf plant$^{-1}$, length of longest basal leaf, leaflet plant$^{-1}$ and fresh weight leaves (g plant$^{-1}$) were recorded from the selected plants. In all two cuttings were taken (1$^{st}$ at 35 DAS and second 50 DAS) and the biomass collected from the plots of both the cuttings was added and yield (kg ha$^{-1}$) was calculated accordingly. Results were consistent during all the four years and discussed based on pooled analysis. The statistical analysis was done as per the procedure suggested by Panse and Sukhatme (1985).

## Results and discussion

### *Seed germination and flowering*

Results of the present investigation revealed that number of days to germination initiation and completion after seed sowing was influenced significantly among different varieties (Table-1). Seed germination initiation of AGCr-1 coriander was earliest (6.83 DAS) than other tested varieties. The germination process was also completed earliest (11.58 DAS) in ACr-1 while, latest was observed in the variety JSS-R-50 (15.19 DAS). The reason for varying germination percentage among the varieties can be attributed to the genetic constituency of each genotype endowed with certain capacity to meet the conditions and take advantage of them during the germination, which might be the reason for differences in germination among the genotypes. The results on germination percentage of coriander cultivars were conformity with the report of Dhokle *et al.*, (2010) and Ewase *et al.*, (2013).

Flower initiation (bolting) is one of the most important characters for production while selecting variety for green leaf production. It is evident from Table-1 that varieties AGCr-1 and IC-771744 took maximum days (52.58 days) for initiation of flowering while variety JBT-38/94 bolted in 36.58 days followed by ACr-1 (42.90 days). Likewise variety reached to 50% flowering was recorded delayed in AGCr-1 (65.10 days) followed by IC-771744 (58.88 days), which was statistically significant. Islam *et al.*, (2004) stated the character, days to flower stalk emergence instead of bolting and they reported that flower stalk emergence ranged from 43.00 to 52.55 days.

### *Plant height at harvest*

Findings of the present investigation exhibited (Table 1) that plant height at harvest ranged from 14.84 to 21.80 cm. Maximum plant height was recorded by AGCr-1 (21.80 cm) which was superior to all other varieties under evaluation and the minimum plant height at harvest was observed in JSS-R-50 (14.84 cm). Plant height is an important parameter from crop management point of view. Significant differences observed among the genotypes might be due to early vigour associated with the genetic potential of the individual genotype. The ability of the genotypes to partition photosynthates might also be different reflecting their genetic makeup and environment. Significant differences among coriander genotypes in plant height were reported by Giridhar and

**Table 1.** Evalution of coriander varieties in off season under shade net for initiation of germination, complete germination, flowering and plant height (Pooled 2014 to 2017)

| Verities | Initiation of germination (DAS) | Complete germination (DAS) | Initiation of flowering (DAS) | 50% flowering (DAS) | Plant height at harvest (cm) | Ist leaf length (cm) | IInd 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 |
| S.Em± | 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 |

Sarada (2005), Saxena *et al.*, (2005) and Verma *et al.*, (2014) in coriander.

***Leaf and leaf characters***

In off season evaluation of coriander cultivars under shed net environment, the results revealed that (Table 1 & 2) the variety AGCr-1 exhibited maximum length of first leaf (17.03 cm), second leaf (15.95 cm), highest number of basal leaf plant$^{-1}$ (10.48), highest length of longest basal leaf (18.18 cm.) and maximum number of leaf lets plant$^{-1}$ (7.47) among all the varieties evaluated. The changes in leaf number observed in summer seasons might be due to the influence of environment on the genotype and the response of genotype to such diverse changes in weather conditions. Similar studies were done by Bashtanova and Flowers (2011), Prabhu and Balakrishnamurthy (2006) and Moniruzzaman *et al.*, (2013) in coriander. In another study, considerable variability among coriander genotypes for number of leaves per plant observed by Chaulagain *et al.*, (2011).

***Green leaf yield***

It is inferred from the present investigation that green leaf yield of coriander was significantly varied among different varieties tested during off season under shed nets. It is obvious from the data presented in table-2 that maximum green leaf yield (2732.89 kg ha$^{-1}$) was exhibited by variety AGCr-1 followed by IC-771744 (2289.14 kg ha$^{-1}$). However, minimum leaf yield (1567.97 kg ha$^{-1}$) was recorded in variety JSS-R-50. In the current study, high green leaf yield in certain cultivars might be due to the presence of desirable traits like more plant height, numerous leaves, high leaf area and leaf shoot ratio, fresh leaf weight and fresh plant weight. Telci and Hisil (2008) reported that growing season, genotype and crop nutrition play critical role in attaining high herbage yield in coriander. In another study Telci *et al.*, (2006) also reported that herbage yield and essential oil quality significantly differed in two varieties. The current investigation also presented a scenario where there was inconsistent performance of certain coriander cultivars depending on the season of cultivation. Khah (2009) observed that the inconsistency in the performance of genotypes in different seasons is probably the different field climatic conditions, such as long photoperiod and temperature during summer which are particularly important for bolting. The present findings are in accordance with the reports of Palanikumar *et al.*, (2012) and Moniruzzaman *et al.*, (2013). Ahlawat *et al.*, (2000) reported that Panta Haritima is a good yielder of leaves having the smooth leaves with good fragrance and attractive green colour.

***Essential oil content***

Essential oil of some of the best varieties regarding yield was studied during off season evaluation (Table 2). The herb oil content varied between 0.04 to 0.13 %. The highest leaf essential oil content was recorded in the variety JSS- R-50 (0.13 %) followed by JBT 38/94 (0.10 %) and AGCr-1 (0.08 %), whereas the lowest (0.04 %) was observed in the entries ACr-1 and IC-771744. However, the findings of our study revealed that the total essential oil yield was recorded maximum (2.186 kg ha$^{-1}$) in the green biomass of variety AGCr-1 followed by variety JSS-R-50 (2.038 kg ha$^{-1}$) as compared to the lowest essential oil yield (0.661 kg ha$^{-1}$) in the herbage of variety ACr-1. The variation in herb essential oil content in coriander was also reported by Palanikumar *et al.*, (2012). The variation for oil content among the genotypes might be due to the genetic makeup and yield of the varieties potential and influence of environment. Dudareva *et al.*, (2004) reported that any biotic or abiotic stress during crop growth may promote the synthesis of secondary metabolites in plants, which consequently enhance the essential oil content.

**Table 2.** Evaluation of coriander varieties in off season under shade net for green leaf yield characters and essential oil yield (Pooled 2014 to 2017)

| Verities | No. of Basal leaves plant$^{-1}$ | Length of longest basal leaf (cm) | Leaflet plant-1 | Fresh weight leaves (g plant$^{-1}$) | Essential oil (%) | Essential oil yield (kg ha$^{-1}$) |
|---|---|---|---|---|---|---|
| JSS-R-50 | 7.41 | 12.48 | 5.49 | 2.15 | 0.13 | 2.038 |
| JBT- 38/94 | 7.37 | 14.06 | 5.92 | 2.31 | 0.10 | 1.581 |
| AGCr-1 | 10.48 | 18.18 | 7.47 | 3.18 | 0.08 | 2.186 |
| IC-771744 | 10.48 | 17.50 | 7.22 | 2.50 | 0.04 | 0.916 |
| ACr-1 | 8.47 | 14.48 | 6.32 | 1.63 | 0.04 | 0.661 |
| S.Em± | 0.19 | 0.36 | 0.12 | 0.06 | 0.01 | 0.12 |
| CD(0.05) | 0.55 | 1.04 | 0.34 | 0.18 | 0.02 | 0.37 |

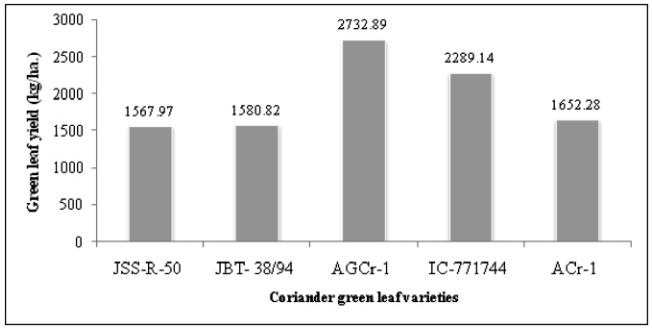


**Fig 1. Green leaf yield of different coriander varieties in off season under shade net.**

## Conclusion

From the present investigation, it is concluded that the performance of variety AGCr-1 was best with respect to plant growth, green leaf yield and essential oil yield among all the tested varieties. Hence, variety AGCr-1 is recommended for off season cultivation under shed nets.

## References


Ahlawat, I. P. S., Prakash, O. and Saini, G. S. 2000. Scientific crop production in India. Meerut: Aman Publishing House (India).

Bashtanova, U. B. and Flowers, T. J. 2011. Diversity and physiological plasticity of vegetable genotypes of coriander improves herb yield, habit and harvesting window in any season. Euphytica., 180(3): 369-384.

Chaulagain, R., Pant, S. S., Thapa, R. B. and Sharma, M. D. 2011. Performance of coriander cultivars for green leaf production under late sowing condition. The *J. Agric. Environ.*, 12: 67-73.

Cowan, A. K., Cripps, R. F., Richings, E. W. and Taylor, N. J. 2001. Fruit size towards an understanding of the metabolic control of fruit growth using avocado as a model system. Physiologia Plantarum., 111: 127–136.

Dhokle, G. C., Naik, P. G., Suryawanshi, A. B. and Phad, G. N. 2010. Performance of different varieties of coriander for yield, quality and germination under Marathwada conditions, *The Asian J. Horti.*, 4(2): 355-357.

Dudareva, N., Pichersky, E. and Gershenzon, J. 2004. Biochemistry of plant volatiles. *Plant Physiology*, 135(4): 1893-1902.

Ewase, A. E. S., Omran, S., El-Sherif, S. and Tawfik, N. 2013. Effect of salinity stress on coriander (*Coriandrum sativum*) seeds germination and plant growth. *Egypt. Acad. J. Biolog. Sci.*, 4(1): 1-7.

Giridhar, K. and Sarada, C. 2005. Identification of coriander (*Coriandrum sativum* L.) genotypes for vertisols of Andhra Pradesh. National Symposium on Current Trends in Onion, Garlic, Chillies and Seed Spices-Production, Marketing and Utilization, SYMSAC-II, 25-27 November. NRCOG, Rajgurunagar, Pp. 92.

Islam, M. S., Rahman, M. A., Mazumder, M. M., Hossain, R. K. and Bhuyan, M. A. J. 2004. Performance of some coriander genotypes for grain yield and its attributes. *Bangladesh J. Agril. Res.*, 29(1): 59-66.

Khah, E.M. 2009. Effect of sowing date and cultivar on leaf yield and seed production of coriander (*Coriandrum sativum* L). *J. Food Agric Environ.*, 7: 332-334.

Lal, G., Mehta, R. S., Singh, R., Kakani, R. K., Meena N. K. and Maheria, S. P. 2016. Effects of nitrogen levels on plant growth and leaf yield of off season coriander under shade nets. *Int. J. Seed Spices*, 6(2): 46-49

Moniruzzaman, M., Rahman, M. M., Hossain, M. M., Karim, A. S. and Khaliq, Q. A. 2013. Evaluation of coriander (*Coriandrum sativum* L) genotypes for foliage yield and its attributes. *Bangladesh J. of Agricultural Research*, 38(1): 175-180.

Palanikumar, M., Rajamani, K. and Muthiah, A. 2012. Correlation studies in coriander (*Coriandrum sativum* L) genotypes for fresh biomass yield and oil content under different seasons. *Crop Res.*, 44(1&2): 217-221.

Panse, V. G. and Sukhatme, P. V. 1985. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi.

Prabhu, T. and Murthy, G. 2006. Evaluation of coriander (*Coriandrum sativum* L) accessions under irrigated conditions for growth, yield and quality. Proc. Nat. Sem. Emerging Trends in Production, Quality, Processing and Export of Spices, 28-29 March, Coimbatore Pp. 13.

Prajapati, D. B., Amin, A. M., Prajapati, B. G., Patel, N. R., Gupta, S. A. and Amin, A. U. 2017. Gujarat Dantiwada leafy coriander-1 a new variety for vegetable purpose. *Int. J. Seed Spices*, 7(1): 68-72.

Saxena, R. P., Pandey, V. P., Datta, J. and Gupta, R. K. 2005. Performance of coriander entries at Kumarganj, Faizabad. National Symposium on Current Trends in Onion, Garlic, Chillies and Seed Spices–Production and Utilization, SYMSAC-II, 25-27 November, NRCOG, Rajgurunagar, Pp. 55-56.

Singh, B., Singh A. K. and Tomar, B. S. 2010. Protected cultivation technology to Bring prosperity. Indian Horticulture, Pp. 31-32.

Spice Board India database. http://www.indianspices.com

Telci, I. and Hisil, Y. 2008. Biomass yield and herb essential oil characters at different harvest stages of spring and autumn sown *Coriandrum sativum*. *European J. of Horticultural Science*, Pp. 267-272.

Telci, I., Toncer, O. G. and Sahbaz, N. 2006. Yield, essential oil content and composition of *Coriandrum sativum* varieties (var. *vulgare Alef* and var. *microcarpum* DC.) grown in two different locations. *J. Essential Oil Res.*, 18(2): 189-193.

Verma, P., Ali, M., Dhosi, V. and Solanki, R. K. 2014. Stability analysis in coriander (*Coriander sativum* L.). *Indian J. Hort.*, 71(1): 126-129.

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