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*Research Article*

# Biochemical Characterization of Coriander (*Coriandrum sativum* L.) Genotypes

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**ABSTRACT**

*Coriander is used all over the world as spice and flavouring agent due to its aromatic and medicinal properties. The seeds and green leaves of coriander are major source of phytochemicals. In the present investigation 23 genotypes of coriander were assayed for their natural source of total chlorophyll content, leaf protein content and ascorbic acid content. The aim of study was to determine which of coriander genotypes could provide better. From the study on mean performance of 23 diverse genotypes, results indicated that there were considerable variation in total chlorophyll content, leaf protein content and ascorbic acid content among genotypes. Among the genotypes, genotype RKC-26 I was recorded highest in total chlorophyll content (2.65 mg/g), genotype COR-56 was recorded highest in leaf protein content (4.6 mg/g) and genotype COR-38 was recorded highest in ascorbic acid content (151.23 mg/100g).*

***Keywords:*** *Coriander, Total chlorophyll content, Leaf protein content, Ascorbic acid content.*

## INTRODUCTION

Coriander (*Coriandrum sativum* Linn.) is an annual seed spice crop that belongs to the family Umbelliferae/Apiaceae and mainly grown during rabi season. The plant is originated from Mediterranean and near eastern region (Bhandari & Gupta, 1991). Coriander is widely cultivated in North Africa, Europe, India, China and Thailand and in recent years countries included Soviet Union, Hungary, Poland, Romania, Czech Republic, Slovakia, Morocco, Canada, Pakistan, Iran, Turkey, Guatemala, Mexico and Argentina (Kiehn & Reimer, 1992). India is the largest producer of coriander crop and it is mainly cultivated in Rajasthan and Gujarat with sizeable acreage in Madhya Pradesh, Haryana, Punjab, Uttar Pradesh, Andhra Pradesh, Tamil Nadu and Bihar.

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Rajasthan is the major coriander producing state and zone V (districts of Kota, Bundi, Baran, Jhalawar) covers approximately 98 percent coriander area of the state. The fresh green herb and a dry spice are the two main products obtained from coriander plants besides steam distilled essential oil and solvent extracted oleo-resin used for the aroma and flavor commercially (Islam et al., 2009). The essential oil obtained from coriander is included among 20 major essential oil in the world market (Lawrence, 1992). The young plants as well as the leaves of coriander are used in the preparation of salad, chutney, curries, soups and sauces. Coriander leaves are the good source of vitamins A and C. The major phytochemicals in the leaves and seeds of coriander are tocopherols, carotenoids, chlorophylls, sugars, ascorbic acid, phenolics, flavonoids, tannins and anthocyanins (Dias et al., 2011). Dietary phytochemicals are also considered as an effective tool to cure various human physiological disorders. Coriander crop has traditionally been referred to as antidiabetic agent (Gray & Flatt, 1999), anti-inflammatory agent and cholesterol lowering agent (Chithra & Leelamma, 1997, Sabahat & Perween, 2007). In coriander crop, most of the research works has been done on its seeds (Srinivasan, 2005, Dhanapakiam et al., 2008) and less has been done to the chemical constituents in leaves (Jangra et al., 2018, Palanikumar & Rajamani, 2012). Furthermore, among all the spices, coriander has much importance due its multiple use as spice as well as an herb and its rapid life cycle allow it to grow under different seasons. Therefore, in order to increase the quality components of this important seed spice-cum-leaf yielding crop and to standardize the crop production technology, breeding of high yielding coriander varieties/genotypes becomes essential. So, the above findings prompted us to determine the level of total chlorophyll content, leaf protein content and ascorbic acid content in 23 diverse genotypes of coriander during rabi season.

## MATERIALS AND METHODS

The present study was carried out with the 23 diverse genotypes of coriander during rabi season 2016-17. Seeds of coriander were procured from Agriculture Research Station, Kota University, Kota, Rajasthan and planted at Department of Molecular Biology and Biotechnology, Rajasthan College of Agriculture, MPUAT, Udaipur, Rajasthan, India in earthen pots for biochemical analysis. List of the coriander genotypes are presented in Table 1. Five competitive plants were randomly selected from each pot in a genotype for recording observation for biochemical analysis. The following observations were recorded in the selected leafy type plants.

**Estimation of total chlorophyll:-** The total chlorophyll content (mg) was estimated by following the method prescribed by starnes & Hardley (1965). Grinding of the fresh sample leaves to a fine pulp with the addition of 20 ml of 80% acetone and the absorbance at 663 nm and 645 nm are read in a spectrophotometer. Using the absorption coefficient, the amount of chlorophyll present in extract on dry weight basis was calculated using the following equation as described by Sadasivam & Manickam (1992) and expressed as mg/g of fresh sample:

Total Chlorophyll Content (mg/g) = $20.2 (A_{645}) + 8.02 (A_{663}) \times V/1000 \times W$

Where, A= Absorbance at specific wavelengths,

V= Final volume of chlorophyll extract in 80% acetone.

W= Fresh weight of the tissue extracted.

**Estimation of ascorbic acid:-** The ascorbic acid content in coriander leaves was estimated by 2, 6-dichlorophenolindophenol (DCPIP) titration method given in A.O.A.C. (1975). The first reaction mixture contained 5 ml of working standard solution (stock solution: 100 mg ascorbic acid in 100 ml of 4% oxalic acid solution then dilute 10 ml of stock solution to 100 ml with 4% oxalic acid) and then added 10 ml of 4% oxalic acid and titrated against the dye ($V_1$) (42 mg sodium bicarbonate and 52 mg 2, 6- dichlorophenol indophenols in 200 ml distilled water). The second reaction mixture contained extracted fresh sample (0.5-5g) in 4% oxalic acid and make up to known

volume and centrifuged. Pipette out 5ml of this supernatant and added 10 ml of 4% oxalic acid and titrated against the dye ($V_2$). End point is appearance of pink color. The amount of the dye consumed is equivalent to the amount of ascorbic acid and was expressed as mg per 100 g of fresh sample using the following equations:

Amount of ascorbic acid = $0.5mg/V_1$ ml × $V_2/15ml \times 100$ ml/wt. of the sample × 100

**Estimation of Leaf protein:-** The leaf protein content was estimated as per the method described by Lowry et al, (1957). The first reaction mixture contained diluted 10 ml of stock solution (50 mg of bovine serum albumin/50 ml of water) to 50 ml with water. The second reaction mixture contained extracted 0.5 g of fresh sample leaves in buffer. Pipette out 0.2, 0.4, 0.6, 0.8, 1.0 ml of the working standard solution into series of test tubes. Pipette out 0.1 ml and 0.2 ml of the sample extract into two other test tubes. Make up the volume to 1 ml with water in all the tubes then added 5 ml solution C [50 ml of solution A (2% Sodium carbonate in 0.1 N NaOH) with 1 ml of solution B (0.5% Copper sulphate in 1% sodium potassium tartrate] and incubated at RT for 10 min. Added 0.5 ml folin-ciocalteu reagents, mix well and incubated again at RT in dark for 30 min. Absorbance recorded at 660 nm against blank. The protein concentration was estimated by referring to standard curve prepared by taking BSA concentration (200 µg/ml) and expressed as mg/g of fresh sample.

**Statistical analysis:** All the experiments were performed in triplicate and the mean data statistically analyzed at p = 0.05.

## RESULTS AND DISCUSSION

The mean values for total chlorophyll (mg/g), leaf protein (mg/g) and ascorbic acid (mg/100g) in 23 genotypes of *C. sativum* L. are presented in Table 2.

**Total Chlorophyll Content**: The genotype RKC-26 I (2.65 mg/g) recorded highest total chlorophyll followed by RKC-53 I (1.903 mg/g) and COR-40 (1.447 mg/g). The genotype COR-49 (0.366 mg/g) recorded lowest total chlorophyll followed by RKC-28 I (0.394 mg/g) and RKS-45 I (0.437 mg/g). The total chlorophyll content in 9 genotypes exceeded the grand mean value of 0.953 mg/g, while, that of 14 genotypes recorded lower than the grand mean value (Table. 2). Similarly Ben et al. (2014) observed that the leaf chlorophyll content differed singnificantly among Tunisian coriander genotypes. The variation in chlorophyll content among genotypes depends upon the penetration of sunlight that enhanced physiological activity. Mahamane et al. (2016) and Palanikumar & Rajamani (2012) observed higher chlorophyll content in coriander during summer season as compared to winter season. Srinivasan (2005) observed higher chlorophyll content during winter season as compared to summer investigation.

**Leaf Protein Content**: The genotype COR-56 (4.6 mg/g) recorded highest leaf protein followed by UD- 507 I (4.2 mg/g) and RKD-18 (4.00 mg/g). The genotype RKC-54 (1.2 mg/g) recorded lowest leaf protein followed by RKC-53 II (1.9 mg/g) and RKC-28 I (2.2 mg/g). The leaf protein content in the 12 genotype exceeded the grand mean of value of 3.11 mg/g, while, that of 11 genotypes recorded lower than the grand mean value (Table 2).

**Ascorbic Acid Content**: Ascorbic acid was maximum in the genotype COR-38 (151.23 mg/100g) followed by RKC-42 I (144.41 mg/100g) RKC-17 I (137.65 mg/100g) and minimum in the genotype RKS-45 I (82.71 mg/100g) followed by RKC-57 I (85.80 mg/100g) and RKC-53 II (85.18 mg/100g). The ascorbic acid content in the 11 genotype exceeded the grand mean value 111.42 mg/g, while, that of 12 genotype recorded lower than the grand mean value (Table 2). Similar observations were recorded by Harshvardhan (2016) and Palanikumar & Rajamani (2012). The higher the intensity of light present during the growing season, the greater ascorbic acid in plant tissues.

**Table 1: List of genotypes used for the present study**

| S.No. | Genotype Code | Genotypes |
|---|---|---|
| 1. | G1 | RCr-436 |
| 2. | G2 | C0R-49 |
| 3. | G3 | RKC-39 I |
| 4. | G4 | RKC- 44 I |
| 5. | G5 | RKD-18 |
| 6. | G6 | RKC- 20 |
| 7. | G7 | RKC- 53 I |
| 8. | G8 | RKC-28 I |
| 9. | G9 | RKC- 57 I |
| 10. | G10 | UD - 509 I |
| 11. | G11 | RKC - 26 I |
| 12. | G12 | RKC - 54 I |
| 13. | G13 | RKC - 42 I |
| 14. | G14 | RKC - 53 II |
| 15. | G15 | RKC- 17 I |
| 16. | G16 | COR - 40 |
| 17. | G17 | COR - 56 |
| 18. | G18 | COR - 38 |
| 19. | G19 | Hisar Anand |
| 20. | G20 | UD - 507 I |
| 21. | G21 | RKC-55 I |
| 22. | G22 | UD-503 I |
| 23. | G23 | RKS-45 I |

**Table 2: Mean performance of 23 genotypes of *Coriandrum sativum* L. for total chlorophyll (mg/g), leaf protein (mg/g) and ascorbic acid (mg/100g) content**

| Code No. | Genotypes | Total chlorophyll (mg/g) | Leaf protein (mg/g) | Ascorbic acid (mg/100g) |
|---|---|---|---|---|
| G1 | **RCr-436** | 0.448 | 3.8 | 132.09 |
| G2 | **COR-49** | 0.366 | 2.9 | 126.54 |
| G3 | **RKC-39 I** | 1.359 | 2.5 | 110.49 |
| G4 | **RKC-44 I** | 0.467 | 2.7 | 108.02 |
| G5 | **RKD-18** | 1.367 | 4 | 97.53 |
| G6 | **RKC-20** | 0.603 | 3.5 | 105.55 |
| G7 | **RKC-53 I** | 1.903 | 3.6 | 100.61 |
| G8 | **RKC-28 I** | 0.394 | 2.2 | 98.14 |
| G9 | **RKC-57 I** | 1.263 | 3.2 | 85.8 |
| G10 | **UD-509 I** | 0.821 | 2.8 | 111.72 |
| G11 | **RKC-26 I** | **2.65** | 3.9 | 121.6 |
| G12 | **RKC-54 I** | 1.133 | 1.2 | 87.03 |
| G13 | **RKC-42 I** | 0.472 | 2.3 | 144.41 |
| G14 | **RKC-53 II** | 1.247 | 1.9 | 85.18 |
| G15 | **RKC-17 I** | 0.672 | 3.4 | 137.65 |
| G16 | **COR-40** | 1.447 | 3.4 | 97.53 |
| G17 | **COR-56** | 0.457 | **4.6** | 120.37 |
| G18 | **COR-38** | 1.265 | 2.4 | **151.23** |
| G19 | **Hisar Anand** | 0.854 | 2.5 | 90.12 |
| G20 | **UD-507 I** | 0.665 | 4.2 | 118.51 |
| G21 | **RKC-55 I** | 0.775 | 3.7 | 136.41 |
| G22 | **UD-503 I** | 0.874 | 3.8 | 113.58 |
| G23 | **RKS-45 I** | 0.437 | 3 | 82.71 |
| | **Grand Mean** | 0.953 | 3.11 | 111.42 |
| | **SEm±** | 0.0150 | 0.0562 | 1.5289 |
| | **CD (P = 0.05)** | 0.043 | 0.160 | 4.358 |

## CONCLUSION

In conclusion, based on biochemical characters, all the genotypes of *C. sativum* L. exhibited total chlorophyll content, leaf protein content and ascorbic acid content but varied in their levels of production. From the study on mean performance of 23 different genotypes, it was concluded that among the genotypes, genotype RKC-26 I contained higher total chlorophyll content (2.65 mg/g), genotype COR-56 contained higher leaf protein content (4.6 mg/g) and genotype COR-38 contained higher ascorbic acid content (151.23 mg/100g). Further, these genotypes can be used successfully in breeding programmes to improve the quality components of coriander genotypes.

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