# A Promising Coriander (*Coriandrum sativum* L.) Genotype WFPS 48-1 for High Yield and Quality for South Eastern Rajasthan, India


## ABSTRACT

Coriander (*Coriandrum sativum* L.), a major seed spice crop of India and Rajasthan is valued for seed and leaf, used for flavouring and seasoning of food and food products. A promising coriander (*Coriandrum sativum* L.) genotype WFPS 48-1 has been identified for high yield and essential oil, on the basis of multilocation testing across the coriander growing states and specifically for Zone V of Rajasthan state. It bears white flowers and recorded average yield of 1933 kg/ha with around 11, 19 and 25 percent superiority over the zonal, state and national checks *viz*., RKD 18, RCr 436 and Hisar Anand, respectively. Its seeds contain higher essential oil content of >0.55% showing an advantage of 6 and 18 percent, respectively over the national checks RCr 728 and Hisar Anand. The genotype WFPS 48-1 could be further used in crop improvement programmes to provide a suitable replacement of the existing varieties to increase coriander production and productivity.



*Keywords: Coriander; Coriandrum sativum L; genotype yield; quality; chemical composition.*


## 1. INTRODUCTION

Coriander (*Coriandrum sativum* L.) is an important seed spice crop cultivated for both seed and leaf, used for flavouring and seasoning of food and food products. India is the largest producer, consumer and exporter of coriander in the world. The total production of coriander in the country was 811 thousand tons from an area of 640 thousand hectare (2021-22). The major coriander producing states are Rajasthan, Gujarat and Madhya Pradesh. It is cultivated in an area of 124286 ha in Rajasthan and produces 182705 m tonnes (2020-21) of coriander seeds. Rajasthan contributes nearly 19 and 20 percent to the country's total area and production, respectively. The south eastern part of Rajasthan *i.e*., humid south eastern plain zone or zone V covering districts of Kota, Bundi, Baran and Jhalawar is the largest producer of coriander in the state where it is cultivated in an area of 118030 ha contributing the production of 173764 m. tonnes (2020-21), thereby contributing around 95 percent to the total area and production of the state.

Development of high yielding varieties is the first and foremost objective of any crop improvement programme to meet the crop's domestic as well international demand. Since coriander is valued for its aroma owing to the presence of essential oil in its seeds and leaves, therefore, besides high yield, high quality also assumes priority. Yield is a complex character dependent on various yield contributing factors. Similarly, essential oil content also varies in varying environmental conditions. In general, seed size has negative correlation while maturity duration has positive correlation with quality suggesting that small sized and late maturing types tend to possess higher content of essential oil and therefore, fetch higher price in the market but late maturing genotypes are generally not preferred for Zone V where there's a sudden rise in temperature and heat stress during the terminal stage of the crop. The essential oil being volatile in nature diminishes fast due to high temperature. Keeping the above facts in view, an attempt was made in the present study to identify a coriander genotype for high yield and quality suitable for the agroclimatic conditions of Zone V of the state.

## 2. MATERIALS AND METHODS

The experiment was conducted at multilocations of zone V *viz*., ARS, Kota, ATC, Bundi, Nanta, Digod, ARSS, Aklera, Khanpur (Jhalawar) during *rabi* 2018-19 to evaluate the coriander genotype against the existing checks for yield, yield contributing and quality traits to identify its suitability for the agroclimatic conditions of Zone V of the state. The trials were conducted following all the recommended package of practices for zone V. The field data were recorded at maturity and statistically analysed while the essential oil content of the genotypes from all the locations was estimated from the seed by Clevenger method in Central Laboratory, ARS, Kota.

## 3. RESULTS AND DISCUSSION

The data recorded on yield in multilocation trials under zone V is provided in Table 1. On the basis of yield data recorded at six locations, the coriander genotype WFPS 48-1 recorded a mean yield of 1933 kg/ha with around 11, 19 and 25 percent superiority over the zonal, state and national checks *viz*., RKD 18, RCr 436 and Hisar Anand, respectively (Table 1). This genotype was earlier evaluated under coordinated trials for three consecutive years during 2015-16 to 2017-18. The data on other yield parameters *viz*., plant height, days to maturity and test weight is provided in Table 2. The genotype WFPS 48-1 is early in maturity as compared to checks RCr 436 and Hisar Anand while it is at par to the popular zonal check RKD 18. The plants are medium tall as compared to taller varieties with height of nearly 100 cm, making them prone to lodging. The seeds are medium bold with an average test weight of 14.9g which is also desirable as more bold seeds are said to be poor in essential oil. The seeds contain essential content of more than 0.44-0.55% showing an advantage of 5, 6, 18 and 50 percent, over the zonal check RKD 18, national checks RCr 728 and Hisar Anand and state check RCr 436, respectively (Table 3).

The popular variety of coriander presently under cultivation in zone V is RKD 18 (Pratap Raj Dhania 1) notified in the year 2015. The superiority and suitability of this variety for the zone has been documented by various researchers in the past [1,2,3,4]. But the varieties more than ten years old need to be replaced by new varieties in the seed chain. The seed replacement rate in coriander is low, therefore, efforts are needed for development and popularization of new genotypes/varieties in the zone.

**Table 1. Yield performance (kg/ha) of WFPS 48-1 at multilocations of zone V during 2018-19**

| Entries/Checks | ARS, Kota | ATC, Bundi | Nanta | Digod | ARSS, Khanpur | ARSS, Aklera | Mean | % increase over check |
|---|---|---|---|---|---|---|---|---|
| **WFPS 48-1** | **1815** | **3810** | **1546** | **1499** | 1265 | 1660 | 1933 | |
| RCr 436 (C) | 1539 | 3274 | 1290 | 1254 | 1117 | 1262 | 1623 | 19.09 |
| RKD-18 (C) | 1591 | 3333 | 1472 | 1405 | 1110 | 1516 | 1738 | 11.20 |
| Hisar Anand (C) | 1244 | 2902 | 1412 | 1348 | 1083 | 1280 | 1545 | 25.09 |
| **CD (5%)** | **172.95** | **595.37** | **217.69** | **263.12** | **270.18** | **200.08** | | |

**Table 2. Ancillary data of WFPS 48-1 under multilocation testing in zone V during 2018-19**

| Entries/ Checks | Plant height (cm) | | | Mean | Days to maturity | | | | Mean | Test weight (g) | | | | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ARS, Kota | ATC, Bundi | ARSS, Aklera | | ARS, Kota | ATC, Bundi | ARSS, Aklera | ARSS, Khanpur | | ARS, Kota | ATC, Bundi | ARSS, Aklera | ARSS, Khanpur | |
| **WFPS 48-1** | 99.82 | 93.26 | 58.00 | 83.69 | 108 | 116 | 112 | 118 | 113 | 14.03 | 16.3 | 16.1 | 13.20 | 14.90 |
| RCr 436 (C) | 85.00 | 86.08 | 61.75 | 77.61 | 108 | 126 | 116 | 118 | 117 | 12.6 | 15.2 | 15.5 | 14.00 | 14.32 |
| RKD-18 (C) | 82.00 | 88.04 | 62.75 | 77.60 | 105 | 116 | 113 | 119 | 113 | 11.62 | 15.7 | 14.6 | 13.20 | 13.78 |
| Hisar Anand (C) | 106.35 | 127.02 | 69.25 | 100.87 | 118 | 130 | 118 | 117 | 121 | 11.50 | 17.7 | 14.5 | 13.60 | 14.32 |

**Table 3. Essential oil (%) of WFPS 48-1 in multilocations of zone V during 2018-19**

| | Testing in coordinated trials | | | | | Testing in Zone V | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Entries/Checks** | **2015-16** | **2016-17** | **2017-18** | **Mean** | **% increase over checks** | **ATC, Bundi** | **ARSS, Khanpur** | **ARSS, Aklera** | **ARS, Kota** | **Mean** | **% increase over checks** |
| **WFPS 48-1** | 0.47 | 0.8 | 0.4 | 0.556 | | **0.51** | **0.52** | **0.40** | **0.36** | **0.4475** | |
| RCr 436 (C) | - | - | - | - | - | 0.31 | 0.32 | 0.28 | 0.28 | 0.2975 | 50.42 |
| RKD-18 (C) | - | - | - | - | - | 0.47 | 0.45 | 0.40 | 0.38 | 0.425 | 5.29 |
| HisarAnand (C) | 0.38 | 0.6 | 0.43 | 0.47 | 18.43 | 0.30 | 0.30 | 0.28 | 0.28 | 0.29 | 54.31 |
| RCr 728 (C) | 0.37 | 0.6 | 0.6 | 0.52 | 6.36 | - | - | - | - | - | - |

Environmental and genetic parameters can affect plants performance [5,6,7]. The production of secondary metabolites in plants depends on different factors such as temperature, light, plant genotype, altitude, slope, and hormones [8,9,10]. Shams et. al. [11] reported that the quantity and quality of active ingredients is influenced by genetic and environmental factors and there is a direct relation between production of plant metabolites and climate factors. Among the climate parameters, altitude and precipitation have the most impact on the essential oil content and dry matter yield of coriander. Low altitudes could increase the essential oil content of coriander. Hanifei et. al. [12] reported that essential oil content significantly increased due to water deficit stress. Gholizadeh et. al. [13] also emphasized on identification of coriander genotypes with desirable essential oil yield in both non stress and stress conditions based on certain indices. Keeping in view the effect of environmental factors on quality of coriander, the essential oil content in the seed of the genotype WFPS 48-1 along with checks grown at multilocations was estimated. Among all the genotypes, the highest essential oil content was observed in the genotype WFPS 48-1, irrespective of the locations, however, the quantity varied as per the locations indicating the effect of environmental factors on essential oil. The genotype WFPS 48-1 is quite distinct in view of its white flower colour as compared to pink flowers of most of the existing varieties. The superiority of the white flower coriander genotypes was reported earlier also by Verma et al. [14]. The distinct morphological traits help in the easy identification of varieties in seed production and certification programmes.

## 4. CONCLUSION

Coriander, like all other aromatic seed spice crops is valued for its quality as well, besides seed yield. Yield and quality show significant genotype-environment interaction and also generally have negative correlation with each other and therefore, development of high yielding and high quality genotypes is highly desirable. The coriander genotype WFPS 48-1 showed superiority in terms of seed yield and quality over the existing state and national checks *viz*., RCr 436, RKD 18 and Hisar Anand, across the environments. Varietal replacement is also necessary to realize higher crop productivity, particularly in cross pollinated crops. Therefore, it is concluded that the genotype WFPS 48-1 could be further used in crop improvement programmes to provide a suitable replacement of the existing varieties in the zone to increase coriander production and productivity.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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