

# Comparisons of Bioactive Compounds in Different Cultivars of Turmeric Grown in Eastern U.P.

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**Abstract-** The present investigation was carried out at field trail of Main Experimental Station, Vegetable Science N.D.U.A. & T., Kumarganj, Faizabad (U.P.) during 2011-12 to study the performance of turmeric cultivars. Cultivar NDH-7 and NDH-8 was found superior in growth characteristics such as plant height, yield of rhizome/plant. NDH-8 found tallest (111.2 cm) while, yield of rhizome per plant was recorded in NDH-7 (303.00 g). The results showed that moisture, mineral, curcumin and essential oil ranged from 9.4 to 12.2 per cent, 3.39 to 5.30 per cent, 3.7 to 5.9 per cent and 3.32 to 8.19 per cent, respectively. NDH-7, NDH-8 and Prahba were found superior among all cultivars and variety.

**Index Terms-** Turmeric, physical parameters, curcumin, essential oil

## I. INTRODUCTION

India is popularly known as the “Spice Bowl of the World” as a wide variety of spices with premium quality is grown in the country since ancient times. Turmeric — the Golden Spice — is widely cultivated in different countries such as India, China, Myanmar, Nigeria, Bangladesh, Pakistan, Sri Lanka, Taiwan, Burma and Indonesia. Among these countries, India occupies the first position in area, viz. 1,75,300 ha and also in production, viz. 7,94,400 tonnes during 2007-08, (Spices Statistics, 2011). In India, turmeric is grown in its 18 states. The states like Andhra Pradesh, Tamil Nadu, Karnataka, Orissa and West Bengal are the major turmeric-producing states in India.

Curcumin, demethoxycurcumin, bis-demethoxycurcumin, and aromatic-turmerone are four major active components of turmeric. Turmeric contains protein (6.3%), fat (5.1%), minerals (3.5%), carbohydrates (69.4%) and moisture (13.1%). The essential oil (5.8%) obtained by steam distillation of rhizomes (Kapoor, 1990) Curcumin (diferuloylmethane) (3–4%) is responsible for the yellow colour, and comprises curcumin I (94%), curcumin II (6%) and curcumin III (0.3%) (Ruby *et al.*, 1995). This investigation attempts to evaluate the physio-chemical characteristics, curcumin and essential oil contents of different cultivars grown in Eastern U.P. for its quality parameters.

## II. MATERIALS AND METHODS

The material for the research work was collected from the field trail of Main experimental station, Vegetable Science N.D.U.A.& T., Kumarganj, Faizabad (U.P.) India. Freshly harvested turmeric rhizomes were sorted, cleaned to remove

hairy roots and washed with potable water to study the general characteristics and quality of turmeric.

### Physical parameters:

The plant height was measured in centimetres as the length at prelude stem from the soil surface to the tip of the tallest leaf. After harvesting, the rhizome of each plant were cleaned by removing adhered soil particles, number of clump per plant was weighed. Length of finger and mother rhizome was taken with the help of scale in centimetres.

### Biochemical parameters:

The powders obtained from dried rhizome of 10 different cultivars viz. NDH-7, NDH-8, NDH-45, NDH-68, NDH-69, NDH-86, NDH-88, NDH-116, NDH-1 and Prahba were taken for analysis of moisture, mineral, essential oils and curcumin content. Moisture content was determined by Rangnana (1986) and mineral content by Hart and Fisher (1971). Essential oil content was estimated by (A.O.A.C., 1970). Curcumin content was estimated by the procedure suggested by the ASTA (1968).

## III. RESULTS AND DISCUSSION

Data in respect to plant height, Yield of rhizome/plant, length of finger rhizome and length of mother rhizome have been shown in Table 1 and graphically depicted in Fig. 1.

For crop improvement in turmeric, plant height determines the yield potential of the genotype (Narayanpur and Hanamashetti, 2003). Therefore plant height is the single most important morphological character on which selection for yield could be made. Reduction in plant height may improve their resistance to lodging and reduce substantial yield losses (Abbasi *et al.*, 1995). It was obvious from table that plant height varied significantly. It varied from 75.96 cm to 111.21 cm. Highest plant height was recorded in NDH-8 (111.21 cm) followed by NDH-68 (107.00 cm) and NDH-69 (106.23 cm) whereas, lowest value was found in NDH-45 (75.96 cm). It was obvious from table that plant height varied significantly. Similar observations have been recorded by Jalani *et al.* (2012), Srivastava and Singh (2003).

Yield of rhizome/plant varied from 191.46 g to 303.00 g. Maximum yield of rhizome/plant was recorded in NDH-7 (303.00 g) followed by Prahba (300.36 g) and NDH-116 (295.86 g). Minimum yield of rhizome/plant was accounted 191.46 g in germplasm NDH-88. The data with respect to yield of rhizome /plant varied significantly. The variation in the yield among the all turmeric cultivars grown under the same agro climatic condition can be attributed to genetic factor. The results have

been supported by Chaudhary *et al.* (2006) and Srivastava and Singh (2003).

The data showed that length of finger rhizome varied from 5.26 to 11.83 cm, maximum length of finger rhizome was recorded in Prabha (11.83 cm) followed by NDH-8 (11.26 cm) and NDH-68 (9.10 cm). Minimum yield of rhizome/plant was found 5.26 cm in germplasm NDH-69. The data regarding to the length of finger rhizome varied significantly. These results have been close correlation from Jalani *et al.* (2012).

In respect of data on length of mother rhizome ranged from 5.16 to 9.96 cm. Maximum length of mother rhizome was found 9.96 cm in NDH-8 followed 8.73 cm in NDH-69 and 8.63 cm in NDH-1 whereas minimum length of mother rhizome was recorded 5.16 cm in NDH-45. The study highlighted that length of mother rhizome varied significantly. Similar observations have been recorded by Kamal and Yousuf (2012) and Lokhande *et al.* (2013).

Data pertaining to moisture content, mineral content, curcumin content and essential oil content turmeric rhizome have been shown in Table 2 and graphically depicted in Fig.2. The data showed that moisture content varied from 9.41 to 12.20 per cent. It was observed that maximum moisture content was found in NDH-116 (12.20%) followed by NDH-88 (11.80%) and NDH-7 (11.66%), whereas minimum value was recorded in NDH-1 (9.41%). In respect to moisture content in turmeric rhizome germplasm varied non significantly among the cultivars. Results are in agreement to Fattepurkar *et al.* (2009).

It was indicated that mineral content varied from 3.39 to 5.30 per cent in 2011-12 and 3.89 to 5.21 per cent in 2012-13. Highest mineral content was recorded in NDH-7 (5.30%) followed by NDH-8 (5.16%) and NDH-1 (5.12%) while lowest value was recorded in NDH-86 (3.39%). It was revealed from the data that mineral content varied significantly. Similar observations were also recorded by Souza and Gloria (1998), Niranjana *et al.* (2003) and Fattepurkar *et al.* (2009).

It was revealed from the data that curcumin content varied significantly. It was indicated that curcumin content from varied from 3.70 to 5.90 per cent. Maximum curcumin content was recorded in NDH-1 (5.90 g/100g) followed by NDH-68 (5.50 g/100g) while minimum value was recorded in NDH-45 (3.70 g/100g). The results have been supported by Mnnjunath *et al.*, (1991), Fattepurkar *et al.* (2009) and Kamble *et al.* (2011).

The data showed that essential oil content varied from 3.32 to 8.19 per cent, it was observed that maximum essential oil content was found in NDH-8 (8.19%) followed by NDH-69 (8.14%) and NDH-86 (7.60%) while minimum value was recorded in NDH-45 (3.32%). In respect to essential oil content in turmeric rhizome germplasm varied significantly. Results are in agreement to Kumar *et al.* (1997) and Lokhande *et al.* (2013).

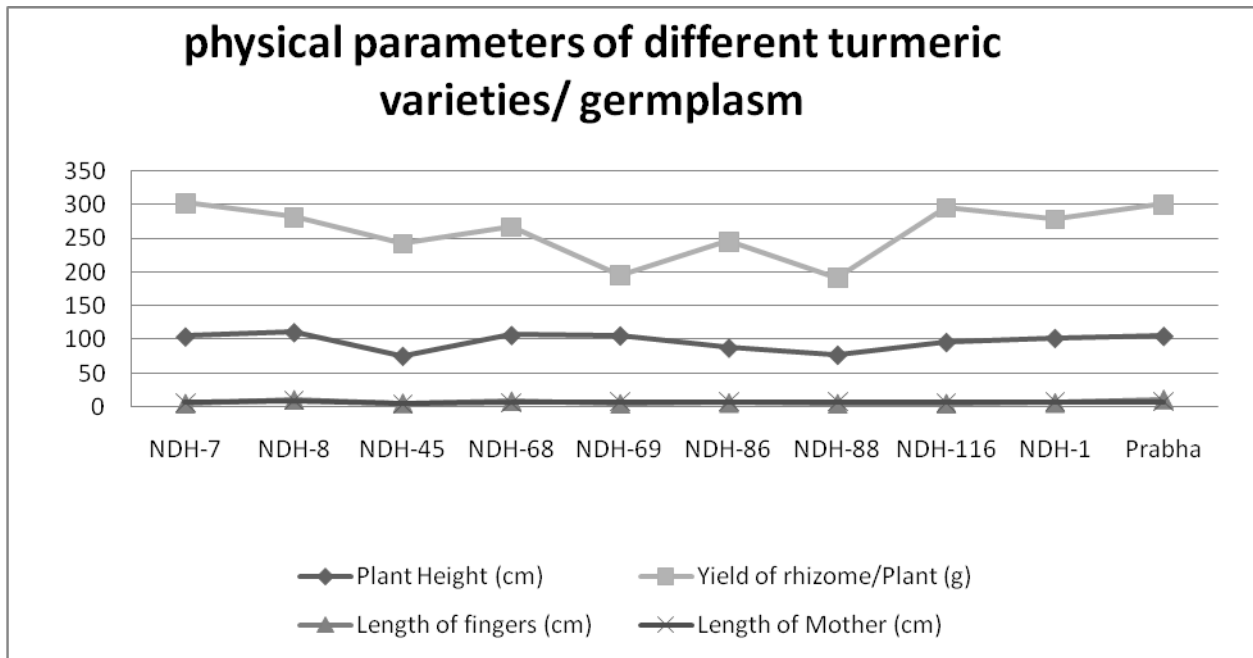
#### IV. CONCLUSION

From the result it had been concluded that, turmeric grown in the Eastern U.P. India found economically and medicinal viable for commercial and profitable production of turmeric (*Curcuma longa* L) under the agro-climatic condition present

| Varieties/<br>Germplasm | Plant<br>Height<br>(cm) | Yield<br>of<br>rhizome/Plant<br>(g) | Length<br>of<br>fingers<br>rhizome(cm) | Length<br>of<br>Mother<br>rhizome<br>(cm) |
|-------------------------|-------------------------|-------------------------------------|--|---|
| NDH-7                   | 104.80                  | 303.00                              | 5.56                                   | 6.86                                      |
| NDH-8                   | 111.21                  | 281.90                              | 11.26                                  | 9.96                                      |
| NDH-45                  | 75.96                   | 242.06                              | 6.10                                   | 5.16                                      |
| NDH-68                  | 107.00                  | 267.37                              | 9.10                                   | 6.70                                      |
| NDH-69                  | 106.23                  | 196.13                              | 5.26                                   | 8.73                                      |
| NDH-86                  | 88.10                   | 245.73                              | 6.60                                   | 8.03                                      |
| NDH-88                  | 77.66                   | 191.46                              | 5.50                                   | 8.06                                      |
| NDH-116                 | 96.60                   | 295.86                              | 5.56                                   | 6.70                                      |
| NDH-1                   | 102.66                  | 279.10                              | 6.66                                   | 8.63                                      |
| Prabha                  | 105.66                  | 300.36                              | 11.83                                  | 8.26                                      |
| CD@ 5%                  | 12.125                  | 51.922                              | 0.835                                  | 0.796                                     |
| S. Em ±                 | 4.079                   | 17.477                              | 0.279                                  | 0.264                                     |

here. Some of the cultivars show better performance in yield characteristics as well as in medicinal components viz. curcumin and essential oil, which positive result for its commercialization as food preservatives, additives and nutraceutical foods.

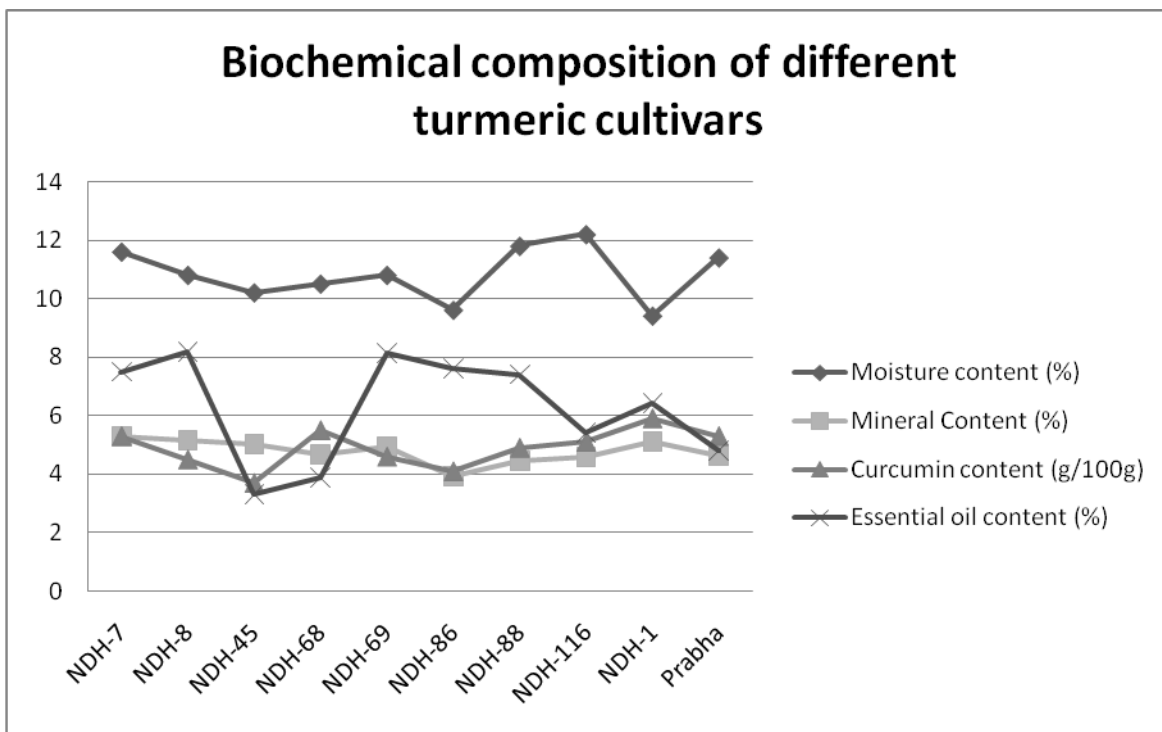
**Table 1: Variation in physical parameters of different turmeric cultivars**



**Fig. 1: Variation in physical parameters of different turmeric cultivars**

**Table 2: Variability in biochemical composition of different turmeric cultivars**

| Varieties/<br>Germplasm | Moisture content (%) | Mineral Content (%) | Curcumin content (g/100g) | Essential oil content (%) |
|-------------------------|----------------------|---------------------|---------------------------|---------------------------|
| NDH-7                   | 11.66                | 5.30                | 5.30                      | 7.50                      |
| NDH-8                   | 10.83                | 5.16                | 4.50                      | 8.19                      |
| NDH-45                  | 10.26                | 5.03                | 3.70                      | 3.32                      |
| NDH-68                  | 10.53                | 4.69                | 5.50                      | 3.91                      |
| NDH-69                  | 10.83                | 4.94                | 4.60                      | 8.14                      |
| NDH-86                  | 9.60                 | 3.93                | 4.10                      | 7.60                      |
| NDH-88                  | 11.80                | 4.47                | 4.90                      | 7.41                      |
| NDH-116                 | 12.20                | 4.59                | 5.10                      | 5.44                      |
| NDH-1                   | 9.41                 | 5.12                | 5.90                      | 6.44                      |
| Prabha                  | 11.42                | 4.63                | 5.30                      | 4.81                      |
| CD @ 5%                 | NS                   | 0.436               | 1.054                     | 1.063                     |
| S. Em ±                 | -                    | 0.144               | 0.358                     | 0.357                     |



**Fig. 2: Variability of biochemical composition of different turmeric cultivars:**

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