Performance evaluation of Garlic (*Allium sativum* L.) in the plains of Kerala

S. Jalaja Menon* and S.N. Shibana

College of Horticulture, Vellanikkara, Kerala Agricultural University
Thrissur – 680656, India

*E-mail: jalaja.menon@kau.in

**ABSTRACT**

Kerala, the spice bowl of India is popular for tropical spice crops like pepper, cardamom, nutmeg etc. Garlic, an important foreign exchange earner of India is produced mostly in the states like Madhya Pradesh, Rajasthan and Gujarat. In Kerala it is grown commercially in two unique rain shadow pockets, Kanthalloor and Vattavada regions of Devikulam block of Idukki district. Although garlic is grown in the high ranges of Kerala, its cultivation in plains are not evaluated so far. Generally cool season crops performs well in plains when grown during October – March. Hence the present study was conducted to evaluate the performance of two genotypes Singapore and Mettupalayam in the plains. The two garlic genotypes were grown as pot culture during October – February in the year 2016-2017, in the plains of Thrissur district, the central part of Kerala. Among the two types Mettupalayam was found to be recorded higher Bulb weight (14.53g) and number of cloves per bulb (4.2), but it was less compared to that grown in high ranges (17.19g and 11.9 respectively). Hence the study revealed the possibilities of garlic cultivation in the plains of Thrissur district of Kerala with some refinements in agro techniques.

**Key words:** Garlic, plains, Kerala, performance evaluation

**INTRODUCTION**

Kerala having a tropical wet climate with high humidity and rainfall is popular for tropical spice crops like pepper, cardamom, nutmeg etc. Garlic, an important foreign exchange earner of India, prefers cool moist period during growth and relatively high temperature during bulbing. In Kerala it is grown commercially in two unique rain shadow pockets, Kanthalloor and Vattavada regions of Devikulam block of Idukki district. The area lies in the high ranges with annual temperature of 23.7°C and rainfall 1276 mm. “Mettupalayam”, “Singapore” and “Malapoondu” are the major garlic genotypes growing in this region (Menon *et al.*, 2017). Yield contributing parameters like equatorial diameter, polar diameter and bulb weight were more in genotype Singapore grown in the hill top. Though garlic is grown commercially in high ranges of Kerala, its cultivation in plains of Kerala is not evaluated so far. In this background the present study was conducted as a preliminary evaluation to understand the performance of this cool season spice crop in the plains.

**MATERIAL AND METHODS**

The present study was conducted at College of Horticulture, Vellanikkara, Thrissur district during the rabi season (October – February) of 2016 - 2017. The area lies at 10.52°N and 76.21°E and at an altitude of 2.83m above Mean Sea Level with an average rainfall of 3000mm. The soil was porous sandy loam with average pH of 4.8.

The maximum temperature during the crop period was 36.0°C and minimum 22.2°C and the average relative humidity was 64.6%. The total rainfall received was 10.4cm and the total rainy days were 8 (Table 1).
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The experiment was laid out in Completely Randomized Design with 15 replications. The plants were grown in earthen pots of 30 cm diameter with five plants per pot. The varieties grown were ‘Singapore’ and ‘Mettupalayam’. The seeds were collected from the traditional growing tract of Kanthalloor panchayath. Morphological characterization of seeds was also done before the commencement of trial. The average size of seeds was 1.5-2g. The crops were raised as per POP recommendations (KAU, 2016).

The plants were selected randomly to record the observations on plant height (cm), number of leaves, leaf colour, leaf shape, leaf length (cm), leaf width (cm), plant girth (cm), stem colour, bulb weight (g), equatorial diameter (cm), polar diameter (cm), average number of cloves per bulb, clove length (cm), clove width(cm), clove weight(g) and clove skin thickness(mm). The data was analysed in WASP 2.0.

**RESULTS AND DISCUSSION**

**Morphological characterization of seed materials:** Seeds of ‘Mettupalayam’ and ‘Singapore’ collected from the traditional growing tract of Kanthalloor panchayath were characterized before planting. The bulb and cloves were cream coloured in Mettupalayam and was light purple in Singapore. The seeds of Singapore have high bulb weight, equatorial diameter, polar diameter, number of cloves and clove weight (Table 2).

| Characters                  | Mettupalayam | Singapore |
|-----------------------------|--------------|-----------|
| Bulb shape                  | Round        | Oval      |
| Bulb colour                 | Cream        | Light purple |
| Clove skin colour           | Yellow       | Light purple |
| Clove flesh colour          | Yellow       | Yellow    |
| Equatorial diameter (cm)    | 3.660        | 4.330     |
| Polar diameter (cm)         | 3.560        | 4.200     |
| Bulb weight (g)             | 17.193       | 21.781    |
| Number of cloves per bulb   | 11.900       | 12.100    |
| Clove weight (g)            | 1.654        | 2.035     |
| Clove length (cm)           | 3.610        | 3.400     |
| Clove width (cm)            | 1.070        | 1.295     |
| Clove skin thickness (mm)   | 0.095        | 0.098     |

**Performance evaluation in Plains**

**Biometric characters:** The observations on plant height, number of leaves, leaf colour, leaf shape, leaf length, leaf width, plant girth and stem colour of both the genotypes were recorded at 60 days and 90 days after planting. The results revealed that highest plant height (58.40 cm) was recorded in the genotype Mettupalayam (Table 3). The genotype Singapore recorded better growth in respect of leaf length (50 cm), leaf width (1.9 cm) and plant girth (2.2 cm). But the number of leaves was more in Mettupalayam (8). The plant height and number of leaves are the important components of growth which helps in the accumulation of photosynthates in the bulb contributing highest yield (Umamaheswarappa et al., 2014). (Plates 1 & 2)

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Table 1. The weather data during the crop period in the plains of Thrissur district

| Year | Month | Max temp (°C) | Min temp (°C) | RH % | Rainfall (mm) | No. of rainy days | Sunshine (hrs) | Wind speed (km/hr) |
|------|-------|---------------|---------------|------|---------------|-------------------|-----------------|-------------------|
| 2016 | Oct   | 31.5          | 22.7          | 81   | 37.3          | 4                 | 5.5             | 1                 |
|      | Nov   | 32.9          | 22.2          | 69   | 13.8          | 1                 | 5.8             | 1.9               |
|      | Dec   | 32.4          | 22.3          | 53   | 52.9          | 3                 | 6.5             | 2.9               |
| 2017 | Jan   | 34.1          | 22.9          | 51   | 0             | 0                 | 7.6             | 5.3               |
|      | Feb   | 36            | 23.2          | 51   | 0             | 8.7               | 6.6             |                   |

(Source: Agromet observatory, Vellanikkara, Thrissur)

Table 2. Morphological characterization of seed materials

| Characters                  | Mettupalayam | Singapore |
|-----------------------------|--------------|-----------|
| Bulb shape                  | Round        | Oval      |
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Mettupalayam is having partly curved, light green leaves, whereas, flat and dark green leaves were observed in Singapore as seen in high ranges. The pseudostem of Singapore has anthocyanin pigmentation but it was absent in Mettupalayam.

**Table 3. Biometric characters of Garlic genotypes grown in plains of Kerala**

| Characters         | Mettupalayam | Singapore |
|--------------------|--------------|-----------|
| Plant height       | 49.60 DAP*   | 54 DAP    |
| No. of leaves per plant | 7            | 5         |
| Leaf length        | 45           | 50        |
| Leaf width         | 1.1          | 1.5       |
| Plant girth        | 1.6          | 2         |
| Leaf shape         | Partly curved| Flat      |
| Leaf colour        | Green        | Dark green|
| Pseudostem – Anthocyanin colouration | Absent | Present |

(*DAP – Days after planting)

**Qualitative characters of bulbs**

The bulbs of both the genotypes were oval in shape. Bulb and clove skin colour of Mettupalayam genotype was cream whereas it was light purple in Singapore (Table 4). The clove flesh colour of both genotypes were yellow.

**Table 4. Qualitative characters of garlic bulbs grown in plains of Kerala**

| Characters         | Mettupalayam | Singapore |
|--------------------|--------------|-----------|
| Bulb shape         | Oval         | Oval      |
| Bulb colour        | Cream        | Light purple |
| Clove skin colour  | Cream        | Light purple |
| Clove flesh colour | Yellow       | Yellow    |

**Yield attributes**

Data pertaining to bulb weight, equatorial diameter, polar diameter, average number of cloves per bulb, clove length, clove width, clove weight and clove skin thickness of two genotypes are depicted in Table 5. Among the two genotypes Mettupalayam recorded higher bulb weight (14.53 g). The equatorial diameter, polar diameter and number of cloves per bulb were also high in Mettupalayam (Fig 1).
Sharma et al (2015) reported that bulb weight, the important yield contributing character was associated with plant height, number of leaves per plant, bulb diameter and number of cloves per bulb. The genotype Mettupalayam with higher bulb weight also recorded higher plant height and number of leaves indicating a better accumulation of photosynthates under tropical humid climatic situations prevailing in the plains. Studies conducted in the non-traditional western ghat areas of Karnataka also revealed that some varieties performed significantly higher in terms of bulb and clove size (Tripathi and Karunakaran, 2015).

The bulb weight and equatorial diameter of Mettupalayam grown in the plains were on par with that grown in high ranges (Table 6). Bulb weight was observed as 17.19g in high ranges and 14.53g in the plains. But the number of cloves per bulb was found to be less in the plains (4.2) compared to that in the high ranges (11.9).

Table 5. Yield attributes of garlic genotypes grown in plains of Kerala

| Variety   | Bulb weight (g) | Equatorial diameter (cm) | Polar diameter (cm) | Average No. of cloves/bulb | Clove length (cm) | Clove width (cm) | Clove weight (g) | Clove skin thickness (mm) |
|-----------|-----------------|--------------------------|--------------------|---------------------------|-------------------|-----------------|-------------------|--------------------------|
| Singapore | 8.30a           | 2.94a                    | 3.94a              | 1.8a                      | 3.1a              | 2.24a           | 4.99a             | 0.18a                    |
| Mettupalayam | 14.53a          | 3.46a                    | 4.38a              | 4.2a                      | 3.36a             | 1.88a           | 4.19a             | 0.18a                    |
| CD(0.05)  | 2.368           | NS                       | NS                 | NS                        | NS                | 0.357           | NS                | NS                      |

Table 6. Comparison of yield attributes of garlic in high ranges and plains

| Sl No | Bulb characters | Mettupalayam | Tvalue (0.01) | Singapore | Tvalue (0.01) |
|-------|----------------|-------------|---------------|-----------|---------------|
|       |                | High Ranges | Plains        | High Ranges | Plains        |
| 1     | Bulb weight (g) | 17.19a      | 14.53a        | 3.012     | 21.78a        | 8.30a          | 3.012             |
| 2     | Equatorial diameter (cm) | 3.66a      | 3.46a         | 3.012     | 4.33a         | 2.94a          | 4.447             |
| 3     | Polar diameter (cm) | 3.56a      | 4.38a         | 3.012     | 4.2a          | 3.94a          | 3.012             |
| 4     | Avg No. of cloves/bulb | 11.9a      | 4.2a          | 3.012     | 12.1a         | 1.8a           | 3.012             |
| 5     | Clove length (cm) | 3.61a      | 3.36a         | 3.012     | 3.4a          | 3.1a           | 3.012             |
| 6     | Clove width (cm) | 1.07a      | 1.88a         | 3.012     | 1.30a         | 2.24a          | 3.012             |
| 7     | Clove weight (g) | 1.65a      | 4.19a         | 4.578     | 2.04a         | 4.99a          | 4.521             |
Whereas the bulb weight of Singapore genotype was only 8.30g in plains and it was 21.78g in high ranges. It was observed that the number of cloves per bulb was low when it is grown in the tropical plains. It indicates that the genotype Singapore is not suitable for plains in the present study.

CONCLUSION

The evaluation of garlic genotypes in the plains of central part of Kerala revealed the genotype Mettupalayam as a better performer. The study also indicate that the short duration genotype Mettupalayam recorded a reasonable bulb weight which is on par with the bulb weight as recorded in the traditional high ranges. This shows the possibilities of growing garlic in the plains of Kerala during October – February with some refinement in production technology. A detailed comparative evaluation of varieties and standardization of agro techniques are required to introduce the crop Garlic in the plains of Kerala.

ACKNOWLEDGEMENT

The authors wish to express sincere thanks to Kerala Agricultural University and the farmers of Kanthalloor Panchayat for the successful conduct of study.

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(MS Received 04 November 2017, Revised 10 October 2018, Accepted 21 December 2018)