RESEARCH ARTICLE

CROP PRODUCTION PROFILE OF GARLIC IN THE RAIN SHADOW REGION OF IDUKKI DISTRICT, KERALA

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Abstract: Commercial garlic cultivation in Kerala is confined to Kanthalloor and Vattavada panchayaths of Devikulam block, Idukki. A unique system of production, curing and storage of garlic exists in this high range, having an annual temperature of 23.7^{0}C and rainfall 1276mm. The study revealed that the extent and experience in garlic cultivation was more in Vattavada though two cropping seasons were practiced in Kanthalloor. "Mettupalayam", "Singapore" and land race "Malapoondu" are the major ecotypes grown in this area. Storability is more in "Singapore" and "Malapoondu" but farmers prefer "Metupalayam" because of its short duration. Yield contributing parameters like equatorial diameter(4.3cm), polar diameter(4.2cm) and bulb weight(21.8g) were significantly high in Singapore. The skin thickness(1.58mm) and average number of cloves per bulb(18.3) were more in "Malapoondu". The major constraints in garlic production as perceived by farmers were small size of garlic cloves, high incidence of pest and disease and attack by wild animals.

Keywords: Bulb characters, Constraints in production, Ecotypes, Garlic, Kerala

INTRODUCTION

Kerala, with its varied agro- ecological conditions encourage the cultivation of an array of spice crops. Idukki being the spice hub of Kerala accounts for maximum area and production in almost all spices. The unique climatic condition and the varied agro ecological situations prevailing in the district, favours cultivation of both tropical, subtropical and temperate spices.

The commercial cultivation of Garlic is confined to Kanthalloor and Vattavada panchayaths of Devikulam Block of Idukki district (Miniraj *et al*., 2005). The area represents low rainfall region having tropical sub humid monsoon climate with an annual temperature 23.7^{0}C and rainfall 1276mm. The area comes under the Marayur Dry Hills Agro Ecological Unit number 17. Here garlic is cultivated in an area of about 80ha with production 630 T (2015-16) as per the Spice statistics of Directorate of Arecanut and Spice Development, Calicut, Kerala. However, there has been a drastic reduction in the area and production of garlic as indicated by the published statistics (DASD, 2016). It indicated that an area of 170 ha with 1510T production of garlic during 2010-11 has been reduced to 80 ha with a production of 630T during 2014-15. It was in this back drop the present study was conducted in Vattavada and Kanthaloor panchayath to assess the crop production profile and the major constraints perceived by farmers in garlic production.

METHODOLOGY

The total sample size for the study was 100. Random sampling was followed in the selection of 50 farmers each from Vattavada and Kanthalloor panchayats. Rapid survey was conducted among the selected farmers through structured pretested interview schedule. Focused group discussions and key informant interviews were also carried out to generate adequate qualitative and quantitative data to assess the crop production profile in this region.

The informations collected from farmers of the two panchayaths and other stakeholders were analysed using descriptive statistics like frequencies and percentages. Separate questionnaires, based on the peculiarities of the region were used among the farmers of the two panchayaths to analyse the constraints in production of garlic. The data were analysed using Garrett ranking method.

Garrett's formula for converting ranks into percent is: Percent position = 100 * (Rij – 0.5)/Nj

Where,

Rij = rank given for ith constraint by jth individual

Nj = number of constraint ranked by jth individual

The per cent position of each rank will be converted into scores referring to the table given by Garrett and Woodworth (1969). For each factors, the scores of individual respondents will be added together and divided by the total number of the respondents for whom scores will be added. These mean scores for all the constraints will be arranged in descending order, the constraints will be accordingly ranked.

The bulbs of the three prevailing genotypes of garlic were collected randomly from farmers' fields and were characterized morphologically as per IBPGR descriptors and analysed statically in the experimental design CRD and compared by DMRT.

RESULT AND DISCUSSION

The crop production profile

Experience in garlic cultivation: The survey revealed that there exist a unique system of crop production, curing and storage of garlic in both the

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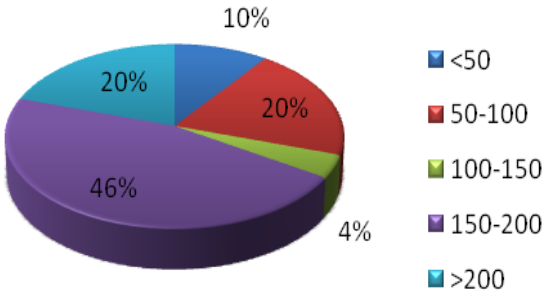
panchayaths of Devikulam block. In Vattavada panchayath, about 86% of farmers had been engaged in garlic cultivation for more than 20 years, whereas in Kanthalloor it was only 26%. Kanthalloor farmers were of recent cultivators and having an experience of less than 20years in garlic cultivation (73%). It was also interesting to note that in Vattavada, 38 % of farmers' have involved in garlic cultivation for about 31-40 years (Table 1).

Table 1. The years of experience in garlic cultivation

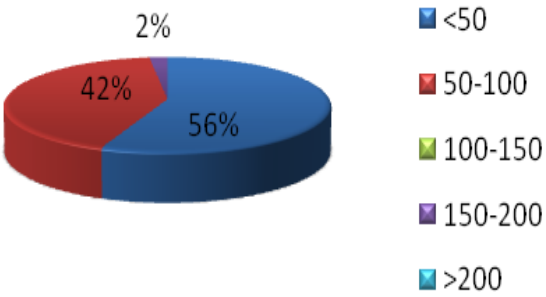
Experience in garlic cultivation (Years)	Vattavada (N=50) (%)	Kanthalloor (N=50) (%)
< 10	0	4.08
11-20	14	69.39
21- 30	18	16.33
31-40	38	10.26
>40	30	0

Area under garlic cultivation: The per capita average area under garlic cultivation in Vattavada was 1.5-2.0 acres (46%) whereas it was less than 50 cents (56 %) in Kanthalloor (Figure 1).



Vattavada

Figure 1. The average area under garlic cultivation



Kanthalloor

Cropping season: Two cropping seasons (May-June to Aug-Sept and Nov-Dec to March-April) were prevailing in Kanthalloor panchayath (62%) as there was enough irrigation facilities. In Vattavada cultivation was only in one cropping season (90 %) and the major cropping season was April –May to August –September.

Market access: The data show that Mettupalayam and Vadakampatty were the main markets for garlic grown in this area. Some small farmers depend on the local markets at Kovilloor, Vattavada. A part of the produce was also marketed through Vegetable and Fruit Promotion Council of Kerala.

Ecotypes: 'Mettupalayam', 'Singapore' and some local collection, 'Malapoondu' are the major ecotypes cultivating in this area (Menon *et al*, 2017). In Kanthalloor there is a practice of growing both the types 'Singapore' and 'Mettupalayam' (86%), whereas in Vattavada, 'Mettupalayam' is the leading type (65%) (Figure.2). But some people prefer 'Malapoondu' in isolated places because of its field resistance and long storability.

Seventy two per cent farmers of Vattavada select the 'Mettupalayam' variety because of its short crop duration of three months. Twenty per cent farmers opined that they cultivate these varieties as the oil content in the garlic grown in the locality was high. In Kanthalloor 64 per cent farmers prefer 'Singapore' because of its high storability.

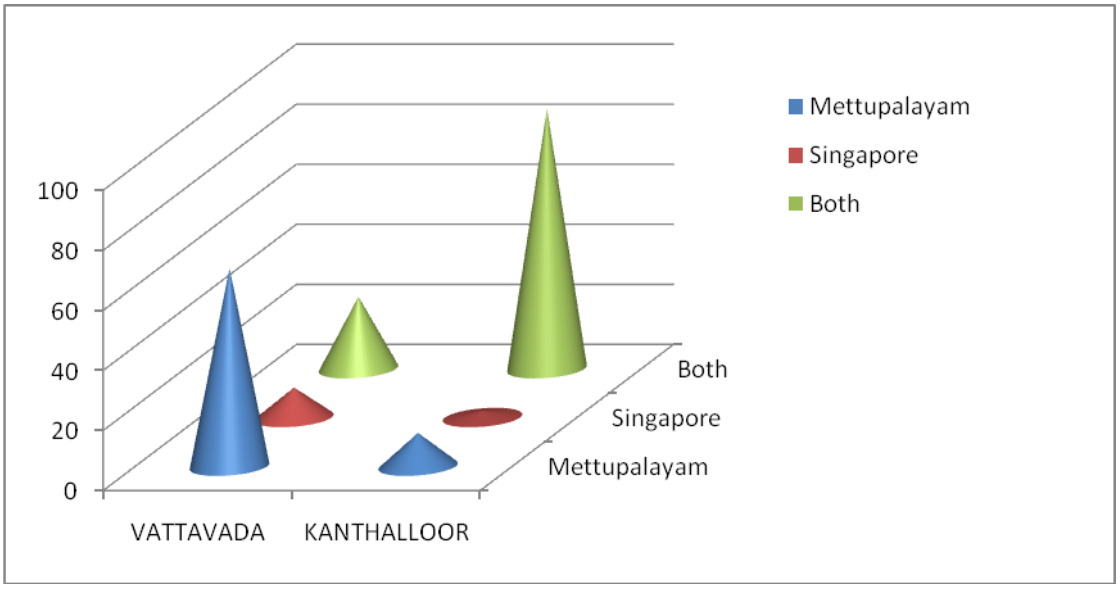


Figure 2. The pattern of preference of garlic ecotype for cultivation

Field curing: There exists a unique system of curing of the crop in the field. Immediately after harvest the bulb with leaves were heaped in a circular manner with bulb inside and leaves towards periphery. It was kept as such for three days and then the bulbs were stalked and dried along with leaves in hanging position and smocked from beneath. These were marketed as small bundles and can be stored for long.

Storage: The storability of garlic is more in "Singapore" and "Malapoondu" genotypes (7-9 months). Hence for the cultivation of this genotype they use their own seeds and they will not depend on open markets, whereas the storability of "Mettupalayam" genotype is 2-3 months and for seed of this ecotype they depend on Mettupalayam market on each growing season (88%).

The morphological characterization of garlic bulb

The bulbs of 'Mettupalayam', 'Singapore' and 'Malapoondu' were collected from three randomly selected farmers' field and morphologically characterized as per IBPGR descriptors and compared with nationally released variety Bhima Omkar. The qualitative characters like Bulb shape, Bulb colour, Clove skin colour and Clove flesh colour were observed (Table 2).

The bulbs of all the varieties were oval in shape except 'Mettupalayam' which was round shaped. Bulb colour was Cream in 'Mettupalayam' and 'Malappoondu'. The bulb and clove were light purple coloured in ecotype 'Singapore' and white in Bhima Omkar. Clove flesh colour of all the ecotypes were yellow.

Table 2. Morphological characters of garlic bulbs

Genotypes	Bulb shape	Bulb colour	Clove skin colour	Clove flesh colour
Mettupalayam	Round	Cream	Yellow	Yellow
Singapore	Oval	Light purple	Light purple	Yellow
Malapoondu	Oval	Cream	Cream	Yellow
Bhima Omkar	Oval	White	White	Yellow

Bulb characters of garlic genotypes like Bulb weight (g), Equatorial diameter (cm), Polar diameter (cm), Number of clove per bulb, Clove weight (g), Clove length (cm) and Clove skin thickness (mm) were depicted in table 3.

Among the four ecotypes the equatorial diameter, polar diameter and bulb weight were significantly higher in 'Singapore'. Bhima Omkar, the national variety released by Directorate of Onion and Garlic Research recorded maximum number of cloves per bulb, but the clove weight was low (0.995g). The clove length was also low in Bhima Omkar (2.8cm). A significantly higher clove thickness was observed in 'Malapoondu' (0.158mm) which was on par with 'Singapore' (0.098mm). Of the three varieties grown in the high ranges of Idukki, 'Singapore' recorded highest equatorial diameter, polar diameter, bulb weight and clove weight. Equatorial diameter, polar

diameter, bulb weight and clove weight are the major components that influence the bulb size which ultimately contributes to the bulb yield (Umamaheswarappa *et al*, 2014).

Table 3. Bulb characters of garlic genotypes:

Varieties	Equatorial diameter (cm)	Polar diameter (cm)	Bulb weight (g)	Number of cloves per bulb	Clove weight (g)	Clove length (cm)	Clove skin thickness (mm)
Mettupalayam	3.660[b]	3.560[c]	17.193[b]	11.900[b]	1.654[a]	3.610[a]	0.095[b]
Singapore	4.330[a]	4.200[a]	21.781[a]	12.100[b]	2.035[a]	3.400[a]	0.098[ab]
Malappundu	3.740[b]	3.920[b]	16.787[b]	13.400[b]	1.872[a]	3.660[a]	0.158[a]
Bhima Omkar	3.780[b]	3.650[c]	16.373[b]	19.500[a]	0.995[b]	2.800[b]	0.043[b]
CD(0.01)	0.333	0.337	4.153	4.077	0.770	0.561	0.081

Preliminary quality analysis

There was a general opinion that the garlic produced from these high ranges have a better aroma and taste. It was generally stored by the farmers after proper curing in the field and smocked in the households for long storage. These bundles of bulbs were usually hanged in households and were marketed in the nearby tourist locations apart from the bulk sale through government marketing systems like Kerala State Horticultural Products Development Corporation and Swasraya Karshaka Samithies of VFPCK. Random market samples were analysed for essential oil extracted from the cloves. The oil recovery ranges from 0.2-0.4%. Dziri *et al*., 2014 reported the yield of 0.1% oil from air dried garlic samples.

Constraints in production

The major constraints in garlic production as perceived by garlic farmers of Kanthalloor and Vattavada region are the small size of the garlic cloves as indicated in table 5. It recorded highest total and average Garrett scores of 43833 and 456.60 respectively. High pest and disease incidence (43332) and wild animal attack (43147) were also ranked 2 and 3 respectively by the farmers. However, majority of farmers did not perceive climate change, lack of irrigation facility, low productivity and non availability of high yielding variety as a serious constraint in garlic cultivation of the area. This was indicated from the relatively low Garrett scores of 9174, 17952, 26658 and 35262 respectively for these factors.

The small size of the garlic cloves can be mostly attributed to the continuous use of local varities and low fertility of the soil. With introduction of appropriate technology and better extension support these constraints can be overcome and better production can be attained.

Table 4. Constraints perceived by garlic growers of Kanthalloor and Vattavada

Sl. No.	**Constraints**	**Garrett Score**		**Rank**
		Total Score	**Avg Score**	
1	Climate change	9174	95.56	12
2	Lack of irrigation facility	17952	187.00	11
3	Low productivity	26658	277.69	10
4	Non availability of high yielding variety	35262	367.31	9
5	**Small size of cloves**	**43833**	**456.60**	**1**
6	**High pest and disease incidence**	**43332**	**451.38**	**2**
7	Lack of awareness on newer production technology	43049	448.43	4
8	Lack of advisory service from Officials	42710	444.90	5
9	Lack of assistance from the Government	42534	443.06	7
10	Lack of proper storage facility	42519	442.91	8
11	Low price of the product	42621	443.97	6
12	**Wild animal attack**	**43147**	**449.45**	**3**

CONCLUSION

Vattavada and Kanthalloor are the two isolated panchayaths of Kerala where a unique system of garlic production, curing and storage exists. The ecotypes in cultivation were short duration "Mettupalayam" and high storable "Singapore". Another land race "Malapoondu" having good shelf

life was also cultivated especially in Vattavada. The oil content of cured samples were high and the peoples claim a peculiar aroma and taste for the product. Detailed evaluation of production practices and chemoprofiling are required to elucidate conclusive results.

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