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RESEARCH PAPER

Constraints faced under open and protected cultivation of vegetables- A case study of tomatoes and capsicum in Karnataka

MANOHAR B H[1] AND BALACHANDRA K NAIK[1]

[1]Department of Agribusiness Management
University of Agricultural Sciences, Dharwad - 580 005, India
E mail: manoharhort4@gmail.com

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Abstract: The present study aimed to analyze the constraints faced by farmers in the production and marketing of tomatoes and capsicum under open and protected cultivation practices in Karnataka. The study was conducted in major two vegetable producing districts of Karnataka. Kolar from South Karnataka and Belagavi from North Karnataka were the two districts selected for the study. Rank Based Quotient (RBQ) was adopted for the analysis. The results indicated that heavy incidence of pests and diseases (RBQ value 69.44) and severe incidence of blossom end rot due to calcium deficiency (RBQ value 85.19) were the major production constraints under open and protected cultivation practices, respectively. Lack of quality planting material and requirement of intensive management practices were the other serious production problems under open field cultivation of tomatoes. While, incidence of fruit borer and requirement of high cost for establishment were the production problems faced by the farmers under protected cultivation of tomatoes. Heavy drop of immature fruits under open cultivation and high cost of establishment under protected cultivation were the other serious problems faced by farmers in production of capsicum. Lower market price during peak harvesting season and high fluctuation in prices for capsicum were the serious marketing problems. Use of disease-free quality planting material, self-raising of seedlings, utilization of calcium fertilizers and adoption of cost-effective management practices and proper portfolio management were the measures suggested to the farmers to overcome these problems. These findings will be helpful to the policy makers and farmers for developing policy framework and relevant guidance for promoting vegetable production in the state.

Key words: Capsicum, Constraints, Rank based quotient, Tomatoes

Introduction

Vegetables are the important constituents of India's agriculture and nutritional security. India is currently producing about 320.48 million tonnes of horticulture produce and has surpassed the food grain production in the year 2021-22 (Ministry of Agriculture and Farmers Welfare, GoI, 2021-22). It has proven beyond doubt that, the productivity of horticulture crops is much higher (12.44 tonnes/ha) compared to the productivity of food grains (2.23 tonnes/ha). India produces around 20,300 thousand tonnes of tomatoes and about 563.02 thousand tonnes of capsicum during 2020 (Anonymous, 2021). Madhya Pradesh, Andhra Pradesh, Karnataka, Tamil Nadu and Orissa are the major tomato producing states in India. All these states together contribute around 50 per cent of the tomato production in the country. West Bengal, Karnataka, Haryana, Jharkhand and Himachal Pradesh are the major capsicum producing states and contributing around 69 per cent of the total production. India is the second-largest producer of tomatoes globally next to China, with the production share of around 11 per cent. India's contribution to global production of capsicum is negligible. China is the leading producer of capsicum, followed by Mexico, Indonesia, Turkey and Spain. Due to their versatile utilization, tomatoes and capsicum gained a step ahead in comparison with other vegetables. Tomatoes are used in cooked form, processed form and even table purpose. Capsicum is being used as a prime ingredient in restaurants across the country. Hence, the area under tomatoes and capsicum is increasing day by day. Usually, tomatoes are grown in open field condition, but due to harsh climatic conditions the protected cultivation technology was adopted by few farmers, where protected technology provides higher returns per unit area compared to open field condition. Generally, capsicum is cultivated under protected conditions. It is of cool season crop and it requires congenial climatic conditions. In spite of the advanced technologies like protected cultivation the farmers are facing problems in production as well as marketing. Therefore an attempt has been made to identify the problems that the farmers producing tomatoes and capsicum under both open and protected environments were facing. This study would help the farmers to overcome the problems faced under open and protected cultivation of tomatoes and capsicum in turn will improvise the farmers income in such a way that reduction in wastages of tomatoes and capsicum. The present study is focused on rank based quotient analysis of production and marketing problems in potential vegetable producing districts of Karnataka.

Material and methods

The present study is concentrated on constraints faced in production and marketing of tomatoes and capsicum produced under open and protected environments. The study was conducted in Karnataka based on primary data collected for the agriculture year 2021-22. Kolar and Belagavi districts were selected for the study, as they were leading tomato and capsicum producing districts in the state during 2017-18 to 2019-20 taking triennium average into the consideration (Department of Horticulture, GoK, 2020-21). Necessary primary data was collected from 15 farmers for each crop in both open and protected conditions from each district. The data were collected from structured schedule. Random sampling method

Table 1. Constraints faced by farmers in production of tomatoes under open and protected environments

Production constraints under open condition (n=30)	RBQ Value	Production constraints under protected condition (n=30)	RBQ Value
Heavy incidence of pests and diseases	69.44	Severe incidence of blossom end rot	85.19
Lack of quality seedlings	55.56	Incidence of fruit borer	81.48
Requirement of more management practices	51.11	Requirement of high cost for establishment	66.67
High cost of plant protection chemicals	48.61	Lack of visits from respective departmental personnel	54.81
Adverse weather conditions	47.78	Short life of cladding material	50.00
High cost of seedlings	47.22	Labour scarcity during peak season	44.44
Lack of technical guidance	44.44	Lack of knowledge regarding value addition	43.33
Scarcity of water	42.50	Lack of technical guidance for production	40.74
Scarcity of labour	41.39	Lack of quality seedlings	33.33
Fruit drop, poor fruit setting and sun scalding	38.33	-	-
Malformation of fruits	34.44	-	-
Uneven ripening	19.17	-	-

was adopted for selection of samples. The Rank Based Quotient (RBQ) analytical tool was adopted for the analysis.

Rank based quotient

Rank Based Quotient (RBQ) technique was used to measure the data collected by preferential ranking technique as suggested by Sabarathnam (1988).

$$RBQ = (\Sigma fi\,(n+1-i) \times 100)/(N \times n)$$

f_i = number of farmers reporting a particular problem under i^{th} rank.

N = Numbers of farmers.

n = numbers of problems identified.

The results of RBQ can be inferred as if the particular constraint showing highest RBQ value then it is considered as most problematic constraint and *vice versa*.

Results and discussion

Constraints faced by farmers in production and marketing of tomatoes under open and protected cultivation practices

Table1 reveals the constraints faced by farmers in production of tomatoes under open versus protected conditions. It is observed from the table that, heavy incidence of pests and diseases (RBQ value 69.44) was the major production constraints faced by the farmers under open cultivation. The fruit and shoot borer, nematodes, aphids, thrips and mites affect the plants in open field conditions. The diseases like damping off, early blight, late blight, anthracnose fruit rot, blossom end rot and tospo virus diseases were some of the diseases that damage tomatoes in open field conditions. Lack of quality seedlings (RBQ value 55.56) was another serious constraint under open cultivation. Most of the farmers preferred seedlings from local private nurseries which were supplied at cheaper rates. But, they were of lower quality. The farmers in the study area had less potential to procure quality seedlings from farther nurseries. Hence, the farmers are suggested to raise seedlings by their own. Requirement of more management practices (RBQ value 51.11) was another serious constraints faced by farmers under open cultivation. Tomato cultivation required intensive cultivation practices and intensive care should be taken to protect the crops under open cultivation. Tomato cultivation requires more management practices, like staking and trailing to individual plants along with other common field activities. Thus, more rigorous management practices are necessary in tomato cultivation and it was perceived as the major constraint.

In protected cultivation of tomatoes in the study area, severe incidence of blossom end rot (RBQ value 85.19) was the biggest problem. Due to calcium deficiency in the soil, the incidence of blossom end rot was the serious problem under protected cultivation. Smoke expectoration from the brick factory also supports the incidence of blossom end rot. Hence, the farmers are suggested to avoid growing of tomatoes nearby brick factory and suggested for judicious application of calcium fertilizers. Incidence of fruit borer (RBQ value 81.48) was another serious problem under protected cultivation of tomatoes. The fruit borer (*Helicoverpa armigera*) affected the tomatoes starting from bearing stage till harvesting in the study area. Requirement of high cost of establishment of protected structure was another major constraints perceived by protected cultivation practicing farmers in the study area (RBQ value 66.67). The farmers who availed subsidies could bare this financial burden, but those who invested through their own resources, could not cope up with high initial investment cost. Thus, fabricating low cost but longer life structures are needed. The research in these lines would help the farmers to reduce their cost of establishment and encourage more farmers to go for protected cultivation. These results are in line with the study conducted by Smitha *et al.* (2016), wherein they concluded that high initial establishment cost, lack of separate market facility and reasonable prices, non-availability of inputs needed for greenhouse plants and non-availability credit in time were the major constraints faced by farmers in adopting greenhouse technology.

Table 2 provides the information regarding marketing constraints faced by farmers in marketing of tomatoes produced

Table 2. Constraints faced by farmers in marketing of tomatoes under open and protected environments

Constraints in marketing of tomatoes (n=60)	RBQ Value
Lower market price during peak harvesting period	77.92
Inadequate market information	68.13
High fluctuation in price	67.50
Lack of minimum support price	66.46
Exploitation by the middlemen	65.63
Improper transportation facility	65.42
Lack of desirable price	61.67
Higher commission charges	60.83

Table 3. Constraints faced by farmers in production of capsicum under open and protected environments

Production constraints under open condition (n=30)	RBQ Value	Production constraints under protected condition (n=30)	RBQ Value
Adverse weather conditions	85.19	Difficulty in maintenance of cladding material	80.00
Heavy drop of immature fruits	84.44	High cost of establishment	77.14
Incidence of anthracnose	59.63	Difficulties in following loan procedure	73.81
High post-harvest losses	58.52	High incidence of aphids and mites	54.76
Development of uneven fruits	53.70	Labour scarcity for harvesting during peak season	40.95
Improper pollination	50.74	Shortage of farm yard manure	36.19
Huge requirement of labour for intercultural operations	45.93	Incidence of soil borne pathogens	31.43
High flower shedding during summer	41.11	-	-
Difficulties in following recommended package of practice	18.15	-	-

under open and protected cultivation. Lower market price during peak harvesting period was the serious constraint faced by the farmers in marketing of tomatoes with highest RBQ value (77.92). During peak harvesting season the supply of tomatoes was more which led to glut in the market. This has obviously reduced the market prices. The farmers in the study area were lacking in market information and intelligence which resulted in inadequate market information (RBQ value 68.13). High fluctuation in price (RBQ value 67.50) was the third most serious marketing constraint opined by the farmers in the study area. Tomatoes have very high price volatility. Many farmers transplant tomatoes at the same time and .all farmers harvest at the same time creating glut in the market. Further, results in sudden slump in the prices. During certain times the prices soar very high owing to scarcity of the produce in the market. To avoid this, farmer need to go for staggered planting. Macro crop planning would help in phasing the production, regular supply to market, avoid glut and ultimately avoid price fluctuation.

Constraints faced by farmers in production and marketing of capsicum under open and protected cultivation practices

Constraints faced by farmers in production of capsicum under open and protected cultivation practices are presented in Table 3. The results reveal that, adverse weather condition (RBQ value 85.19) was the serious production problem under open cultivation of capsicum. Heavy rains led to damping off disease during early stage of capsicum plants under open cultivation. Heavy winds also damage the plants leading to lodging during bearing stage, resulting into fruit loss. Difficulty in maintenance of cladding material (RBQ value 80.00) was serious constraint which was reported under protected cultivation practices. The cladding material made up of polyethylene sheet or shade net which is sensitive to extreme climatic conditions. Wild animals and rodents also damage the cladding material. Heavy drop of immature fruits (RBQ value 84.44) was another serious production problem under open cultivation of capsicum. If the temperature get extreme hot or cold or plants don't have the right amounts of fertilizers, water or lack of proper pollination, the plants would start to drop the fruits. Therefore, farmers are suggested to follow proper maintenance of cultivation practices. Incidence of anthracnose (RBQ value 59.63) was the third most serious problem under open cultivation of capsicum. Capsicum anthracnose is caused by seed borne or air borne pathogens. The fruit become wrinkled, deformed, shriveled and dried when it is affected completely. At later stages of the disease, it results in rotting and fruit spotting which would lead to huge loss. The soil fumigation and usage of quality seedlings are the preliminary preventive measures to avoid infestation of anthracnose. The soil fumigation helps the farm healthy, hence it acts as a preliminary measures to control diseases like anthracnose, damping off *etc.* High cost of establishment with the RBQ value 77.14 was the second most serious constraints under protected conditions. The farmers in the study area availed subsidies for establishment of different types (Iron Pole Poly Houses, Iron Pole Poly Houses and Wooden Pole Shade Houses) of structures. In spite of this, the farmers faced shortage of funds and hence borrowed from other private sources to meet the huge requirement for establishment. These findings suggest the farmers in the study area to go for judicious utilization of available funds. A high investment cost for erecting poly houses wasalso mentioned in the study conducted by Senthilkumar *et al.* (2018). Difficulties in following loan procedure (RBQ value 73.81) was the third most severe constraint faced by farmers involved in protected cultivation of capsicum. This reveals lack of proper guidances, which propels the ways for the respective departments to initiate actions for redressal of the same.

High fluctuation in price was the serious constraint faced by farmers in marketing of capsicum with RBQ value of 80.50 in the study area. Due to market glut and sometimes due to shortage of capsicum in the market the price fluctuates heavily in the markets. To overcome this problem the farmers resorted to selling of capsicum through private companies in the study area. This channel was good at initial days but gradually created monopoly market situation in the study area. Therefore, farmers opined that the monopoly market was the constraint faced in the marketing of capsicum with the RBQ value 57.17. Whereas, exploitation by middlemen was another serious constraint compared to the monopoly market, with RBQ value of 65.33. The farmers are suggested to establish their own group to distribute the products produced in the farm directly to consumers. Organizing Farmer Producer Organizations (FPO) would be a better step in this direction (Table 4).

Conclusion

Based on the findings of the study, it can be concluded that tomato and capsicum producers face many production and marketing constraints. Severe incidence of pests and

Table 4. Constraints faced by farmers in marketing of capsicum under open and protected environments

Constraints in marketing of capsicum (n=60)	RBQ Value
High fluctuation in price	80.50
Exploitation by middlemen	65.33
Monopoly market	57.17
Exploitation by the private companies	55.83
Lower prices in APMC market	55.33
Deterioration of produce	52.67
Faulty weighment by the traders	49.00
Lack of desirable price	43.33
Insufficient storage facility	43.00
Improper transportation	42.67

diseases and blossom end rot is the physiological disorder were the serious problems faced in tomato production under open and protected environment, respectively. Lower market price during peak harvesting period and inadequate market information were the serious problems as opined by tomato producers in the study area. Accordingly, adverse weather conditions and difficulty in maintenance of cladding material were the serious constraints under open and protected cultivation of capsicum, respectively. High fluctuation in price and exploitation by middleman were the serious problems faced in marketing of capsicum. Hence, farmers in the study area were suggested to utilize the pest and disease resistant varieties, procure quality seedlings and avoid cultivation of tomatoes nearby the brick factory to reduce the blossom end rot. Utilization of the quality inputs would reduce difficulties in maintenance of cladding material of protected structures. Maintenance of crop calendar, staggered cropping and organizing direct marketing through Farmer Producer Organizations would reduce the marketing problems through generating remunerative prices. Now-a-days, Farmer Producer Organizations plays a primary role in connecting farmers to the consumers at remunerative prices. These organizations help in distribution of inputs also, hence the farmers would make use of these organizations and take benefit in direct marketing of tomatoes and capsicum.

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