

Sustainable vegetables and flowers cultivation Practices Adopted by Greenhouse Growers in the Sabarkantha

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Abstract—This paper analyzes vegetables and flowers cultivation practices of randomly selected farmers in the Sabarkantha district of Gujarat on the basis of personal interviews and observation. Growers were asked about different cultivation practices of vegetables (Capsicum, tomato), flowers like gerbera they were followed in the greenhouse. 70 per cent and 20 per cent of capsicum growers fell under high and low adoption cultivation practices categories. While 83 per cent of the gerbera growers belonged to high adoption category as well as 17 per cent respondents fell under low adoption cultivation practices categories respectively.

Key words: Greenhouse, growers, adoption category

I. INTRODUCTION

In the wake of trade liberalization and globalization, the agriculture sector in India faces an uphill task of meeting global competition, reducing unemployment. During the last two decades Indian agriculture has been facing major challenges like deceleration in growth rate, inter-sectorial and inter-regional equity, declining input efficiency, degradation of natural resources etc. with consequently adverse effects on food and nutritional security, food inflation and poverty reduction. Diversification of agriculture towards selective high value crops has been recommended as one of the strategies for meeting these challenges (Joshi *et al.*, 2004). To this effect, greenhouse food production is an additional alternative for meeting increased food demand year around.

The Sabarkantha district is potential area of different vegetables and flowers cultivation. The crops cultivated within the greenhouses included Capsicum, tomato, rose, gerbera. In Sabarkantha, greenhouse production was carried out by taking advantage of the favourable climate while keeping the operational cost at a minimum level. Out of total 50 respondents selected for this study, 43 (86%) have preferred to grow vegetables and rest 7 (14%) have flowers. Further, out of 43 vegetables growers, 39 (78%) have opted for capsicum and two (4%) each have tomato and cucumber crop. Among the flower growers, gerbera was the first choice and next was rose. Out of 7 growers 6 preferred gerbera, next was rose. According to area under different crops, it was observed that nearly 78 per cent occupied by capsicum followed by gerbera, 4 per cent each by tomato and cucumber and rest 2 per cent by rose crops.

A common understanding about the different cultivation practices of different vegetables and flowers followed by growers is important in order to develop technologies for production of vegetables and flowers in greenhouses that are suitable with the farmers' needs and

conditions in Sabarkantha. Cultural practices commonly used included soil sterilization, soil preparation, planting, spraying, heating and lighting, controlled released fertilizers, rotation of insecticides etc.

II. MATERIALS AND METHODS

The data of this research is based on in-depth interviews with a number of greenhouse growers that are producing vegetables and flowers for marketing in greenhouses in the Sabarkantha district of Gujarat. The greenhouse growers were interviewed personally with a questionnaire aimed at determining information about the different cultivation practices. Growers were asked about a variety of cultural practices employed in their greenhouses it includes arrangement of bed, details of crop cultivation, Survey questionnaire was made to know present utilization of growing media, irrigation system (drip, etc.) and fertigation techniques, application of pesticides, facility wise location advantages, harvesting and packaging technology of different vegetables and flowers mainly gerbera, rose, capsicum and tomato transportation and storage facilities etc. Information was collected on what are the preferred crops in the structures, their cultivation practices, and crops sequence for better economics.

At this stage, for the purpose of the research, Prantij, Dhansura, Bayad, Idar and Himatnagar villages were selected, which are using greenhouses for producing vegetables and flowers for market and which can represent the district in terms of cultivation techniques, production amounts, field sizes, and geographic and ecological structures. In the selection, statistical data and the suggestions of technicians who have worked in the region for a long time are also taken into account. In these selected areas, covered production includes Capsicum, tomato, gerbera and rose.

III. RESULTS AND DISCUSSION

A. Capsicum crop cultivation practices followed by growers

Exploratory survey indicated that 78 per cent respondents have cultivated capsicum. There were four varieties of capsicum cultivated by the farmer respondents (Table 1), but only one variety was commonly grown by all farmers, i.e. Cizenta (80%). The major reasons for cultivating these varieties were found as adoption to local environmental condition and higher yield. Besides other reasons like shape and size of fruit. Other varieties were used by the farmers are Bacheta & Pasrella (13%) followed by Namdari (7%).

As it is seen in Table about soil and bed preparation activities, due to problems with pathogens and nematodes, soil sterilization was needed; growers applied

methyl bromide to sterilize the soil. About 100 per cent growers use methyl bromide every year. 100 per cent respondents had knowledge of digging of trenches, suitable soil and type of bed to be used. Almost all growers used raised bed for capsicum cultivation. 46 per cent growers had received seedlings of capsicum from various agencies while 54 per cent growers had raised seedlings on farm. 100 per cent respondents followed recommended environment temp (27°C) and soil pH (6.5) for capsicum cultivation. Most farmers used a plant population of three plants per m² (75%); the others used four plants per m².

In case of sowing time, 47 per cent of respondents had followed the time of sowing September to October. Whereas 16.60 per cent of respondents had followed sowing time October to November. The possible reason for this might be that, it is easy to follow, convenient and involves less cost, to get more yield. Majority of the respondents adopted the recommended spacing (100%) of row to row (45cm) and plant to plant (30cm). Concerning about the root media, about 85 per cent surveyed growers used soil+ FYM, while only 15 per cent growers used soil+ compost. 70 per cent respondents adopted recommended dose of FYM (10tonne/acre/year), while 14 per cent respondents had used FYM more than recommended dose. 16 per cent respondents had used compost as root media.

Regarding application of micro and macro nutrients, the nutrition management varied between farmer respondents. 64 per cent of respondents applied as per recommendation, while other applied extra doses. The most commonly used irrigation systems in surveyed greenhouses are high frequency drip irrigation systems.

Sr. no	Practices	Frequency	Percentage
1	Recommended varieties		
	a) Cizenta	31	80
	b) Bacheta & Pasarella	5	13
	c) Namdari	3	7
2	Planting material		
	a) Seedlings raised at farm	21	54
	b) Seedlings received from agency	18	46
3	Recommended spacing		
	Row to row(45cm)	39	100
	Plant to plant (30cm)	39	100
4	Sowing period		
	a) Sep-Oct	18	47
	b) Oct- Nov	21	53
5	Root media		
	a) Soil+ FYM	33	5
	b) Soil+ compost	6	15
6	Macro elements	39	100
	Micro elements	39	100
7	Chemical growth regulator		
	a) yes	19	49
	b) no	20	51
8	Organic measures for disease control		
	a) yes	34	87
	b) no	5	13
9	harvesting of capsicum		

	a) morning	37	94
	b) evening	2	6
10	Packaging of capsicum		
	a) card board box	39	100

Table. 1: Capsicum crop cultivation practices followed by growers (N=39)

However, the timing and the amount of the irrigation was controlled by the growers experience rather than automated scheduling or prescribing nutrients based on plant need during different growth stages or under different environmental conditions. Because of lack of knowledge on efficient pest and disease control, use of pesticide was found quite high in all surveyed area.

In case of harvesting, 94 per cent preferred morning time for harvesting while rest preferred evening period. Some growers (54%) used cutter for harvesting while others (46%) did it manually. Regarding packaging of fruit all growers were used card board box. The yield of capsicum varied between varieties. Cizenta was the best variety in terms of total fruit yield which ranged from 1.8 to 3.5 kg per plant.

B. Overall adoption of recommended cultivation practices of capsicum by farmers

The data in Table 2 revealed that 10 per cent of the respondents belonged to medium adoption category while 70 per cent and 20 per cent of respondents fell under high and low adoption categories respectively.

Sr. no	Categories	Score	Percent
1	Low (<Mean - 0.5S.D.)	<30.14	20
2	Medium (Mean ±0.5 S.D.)	30.14 to 38.66	10
3	High (>Mean + 0.5S.D.)	>38.66	70

Mean=34.4, SD=8.52

Table. 2: Overall adoptions of recommended cultivation practices of capsicum by farmers (N=39)

C. Gerbera crop cultivation practices followed by growers

Exploratory survey indicated that there was less flower cultivation area because of lack of qualified personal working in the flower greenhouse; only 6 growers had gerbera cultivation. Table 3 depicted the cultivation practices followed by gerbera growers. There were four varieties of gerbera cultivated by the farmer respondents. 83 per cent growers had Salvador and china and other varieties were used by the farmers are Dhoni and Savana (17%).

As it is seen from Table about soil and bed preparation activities, growers applied methyl bromide to sterilize the soil. About 100 per cent growers use methyl bromide every year. 100 per cent respondents had knowledge of digging of trenches, suitable soil and type of bed to be used. Almost all growers used raised bed for gerbera cultivation and recommended spacing of 30 x 30 cm to be followed in row to row and plant to plant system of planting. 100 per cent growers had received plants from various agencies.

Sr. no	Practices	Frequency	Percentage
1	Recommended varieties		

	a) selvador & Diana b) Dhoni & Savanna	5 1	83 17
2	Soil and bed preparation a) Soil fumigation i) yes ii) no b) Digging of trench c) Type of bed i) Raised bed	6 6 6	100 100 100
3	Special cultural practices Removal of old leaves	6	100
4	Planting material a) Seedlings raised at farm b) Seedlings received from agency	0 6	0 100
5	Sowing period Nov-Dec Jan-Feb	5 1	83 17
6	Recommended spacing a) Row to row (30cm) b) Plant to plant (30cm)	6 6	100 100
7	Root media a) Soil+ FYM b) Soil+ compost	5 1	83 17
8	Macro elements Micro elements	6 6	100 100
9	Major diseases: Control measures as recommended Major pests Control measures as recommended	6 4 6 4	100 66 100 66
10	a) FYM to be applied per acre? i) 8- 10tonne b) Compost to be applied per acre? ii) 10000 kg	5 1	87 13
11	Chemical growth regulator a) yes b) no	4 2	66 34
12	i)Harvesting of gerbera flower a)morning b)evening ii) Method of harvesting a)pulling by hand b)using cutter c)both iii) At what stage The stage of bud growth and development of flowers	6 3 1 2 6	100 50 17 34 100
13	Treatment of flowers i. Preservatives	6	100
14	Packaging of flowers Card board box	6	100

Table. 3: Gerbera crop cultivation practices followed by growers (N=6)

All respondents followed recommended temp (22-25°C) and pH (6.5) for gerbera cultivation. Most farmers used a plant population of 6 plants per m². The efficient use of pesticides and nutrition was the reason to use a higher numbers of plants per m². 66 per cent growers were using chemical growth regulator.

In case of adoption of special cultural practices, all growers followed practices like raking of soil, removal of old leaves, In case of recommended fertilizer application, 87 per cent of the respondents had applied recommended dose of FYM i.e. 2 kg/sq. m/year while 13 per cent had applied compost. Regarding application of micro and macro nutrients, in general the farmers used readymade nutrition mixes. Almost all respondents applied as per recommendation.

All respondents had followed correct time of harvesting, stage and method of harvesting. Treatment of flowers after harvesting was done by all growers by using preservatives (HQS, AgNO₃). The yield of gerbera flowers varied from variety to variety. Selvador and Diana were found the best varieties for the region in terms of yield which ranged from 37to41 flowers/plant/year which is considered to be higher yield than recommended (36 flowers/plant/year).

D. Overall adoption of recommended cultivation practices of gerbera by farmers

Sr. no	Categories	Score	Per cent
1	Low (<Mean - .5S.D.)	<5.25	17
2	Medium (Mean ±0.5 S.D.)	5.25 to 5.95	0
3	High (>Mean + 0.5S.D.)	>5.95	83

Mean=5.64, SD=0.78

Table. 4: Overall adoption of recommended cultivation practices of gerbera by farmers (N=6)

IV. CONCLUSION

Concerning about cultivation practices, 70 per cent of capsicum and 83 per cent of gerbera growers belonged to high adoption category while 20 per cent of capsicum growers and 17 per cent of gerbera growers belonged to low adoption category of cultivation practices in greenhouse.

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