INDIAN JOURNAL OF
ARID HORTICULTURE
2017, Vol. 12 (1-2):1-15

Determinants and restraints in production of snapmelon (Cucumis melo var. momordica) at large scale in hot arid regions : A study

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(Received: 17.04.2018, Accepted: 8.05.2018)

Abstract

The present study was conducted in Bikaner, Nagaur and Churu districts of western Rajasthan during 2013 - 15. Random method of sampling was used to make total sample size of 108 respondents (snap melon growers) for the study. Further, the selected respondents were personally contacted and interviewed one by one to assess the determinants which encourage (compel the farmers to adopt and grow snapmelon crop at large scale on their fields. Simultaneously, the factors which restrain adoption and production of snap melon crop at large scale were also collected to analyse and drawing inferences of the study. There found deteteminats which lead to encourage farmers for adoption and production of snap melon (*Cucumis melo var. momordica*) at large scale in hot arid regions of the western Rajasthan. Among such determinants major were:" low water requirement of the crop, accessibility of drought escaping local varieties, very short duration crop and easy in cultivation and harvesting, acute shortage of vegetables and substitution for dwellers, likeness of the dwellers as a food stuff and daily dietary item, useable throughout the year in the form of dehydrated products (dry slice) and easiness in preparation vegetable and other dishes, high demand in localities/ local markets/*mandies*, cheapest source of vegetables for all, long shelf life of the fresh fruits at room temperature, the snapmelon is most suitable crop in existing climatic conditions, it can grow with low soil moisture/very low rainfall, has high drought tolerant & escaping capacity, it is a important component existing cropping system, etc. On the other hand, the major restraints (constraints) which hindered the adoption and production of snap melon in hot arid regions were at large scale scarcity of water, very low and erratic rainfall, occurrence of drought very frequently, very deep and poor quality of ground water, unfamiliarity with improved production technologies, lack of viable schemes and support system, poor marketing and market intelligence system and poor extension and information system, etc.

Key words: *Snap melon, adoption of technology, Socio-psychological determinants*

Introduction

Hot arid region of the western Rajasthan covers 12 district including Bikaner, Jaisalmer, Barmer, Jodhpur, Pali, Nagur, Sikar, Jhunjhunu, Churu, Sri Ganganar, Humunangarh and Jalor. It spreads over 61 % area of Rajasthan state and characterized by an annual rainfall between 100 – 500 mm with a coefficient of variation (CV) varying from 40 – 70 %, low and erratic rainfall combined with extremes of temperature (450-500 cal/cm^2/day), low relative humidity, high sunshine and abundant solar energy leading to high rate of evapo-transpiration value ranging from 1600 to 1800 mm in eastern and western part of the region respectively. Other important characteristics of the hot arid region are hot winds with high velocity, poor soil condition, poor ground water with brackish and saline in reaction, poor vegetation, frequent occurrence of drought and frost, difficult to execute agro-techniques, difficulty in post harvest handling and marketing owning to limited and inefficient transportation and marketing facilities (Yadav and Soni, 2008) . Even in such hard and harsh climatic condition, the farmers/dwellers of the hot arid region of western Rajasthan grow several traditional cucurbitaceous vegetables for their own use and sale the surplus for earning money and livelihood security. Among such vegetables, snap melon (*Cucumis melo var. momordica*) is most favourite, most suitable and drought hardy vegetable of study areas of the hot arid region which grown at large scale, particularly during the rainy season. It belongs to family- *Cucurbitaceae*, genus- *cucmis*, species-*melo* and *var. - momordica*. It is locally known as '*phoot or photo kakadi, kakadia*. Snapmelon is a monoecious, an annual climber, its stem are generally covered with rough hairs and vines grow up to 1.5 m which spreads on the ground. The flowers of the same are small, yellow, solitary or rarely in pairs or threes. Initially, the immature fruits of the snap melon are green in colour with hairy surface and have bitterness. As soon as the fruits reach at maturity, their hairs and bitterness disappear and become smooth with relish acidic taste. There is wide variability among the shape, size, appearance and colour of the snapmelon fruits. Most of the fruits of snapmelon are cylindrical, 10-22 cm length with 18-32 cm central girth, green-yellow/reddish-

yellow/creamy-yellow or green with yellow/greens strips/pots at maturity stage. After maturity, fruits reach to over maturity stage and at this stage the fruits start to crake automatically which are locally known as *phoot*. These *phoots* are of sweet-sour in taste and eaten directly as fresh fruit very eagerly by the local peoples of the region. It is one of most liked vegetable of the hot region of the western Rajasthan where it was consumed by > 90 % dwellers/farmers of the region as fresh vegetable, *salad* as well as in different value added forms. It has high nutritional value and work as a mean of food seasoning or relish/palatability of the diet of the dwellers of the study areas. The farmers of the hot arid region of western Rajasthan adopt and produce snapmelon at large scale during k*harif* and summer season and earn a lot of money and other benefits from it. It is one of the major component crop of their cropping system, particularly of the mixed cropping system. However, the actual detriments which leads to grow to produce snapmelon at large scale in hot arid ecosystem of western Rajasthan are not yet crystal-clear, Keeping these facts in mind, this study was under taken with the following objectives:

1. To assess the determinants (factors) which encourage the farmers for adoption and production of snapmelon at large scale in hot arid region.
2. To analyze the restraints (constraints), if any which lead to restrain the adoption and production of snap melon at large scale in hot arid regions.

Methodology

The present study was conducted in Bikaner, Nagaur and Churu districts of western Rajasthan during 2013 - 2015. Bikaner district consist of 08 block/ Tehsils (*viz.*, Bikaner, Nokha, Loonkaransar, Khajuwala, Shri Dungargarh, Kolayat, Chhattargarh, Pugal) and 1498 villages. The Nagaur district consist 12 block/Tehsils (*viz.*, Nagaur, Kheenvsar, Jayal, Merta City, Degana, Didwana, Ladnun, Parbatsar, Makrana, Kuchaman City, Nawa,Mundwa) and 1607 villages. The Churu district consist of major 06 block/Tehsils (viz., Churu, Ratangarh, Taranagar, Rajgarh, Sardarshahar, Sujangarh) and 899 villages. Two blocks from Bikaner distract (i.e. Bikaner and Sri Dungargarh), two blocks from Nagaur distract (i.e. Nagaur and Jayal), and two Block from Churu dostrict (i.e. Ratangarg and Sardarshahar) were selected purposively keeping the facts in mind like majority of the farmers of these block grow snapmelon, have good transportation facilities, approachability, etc. Thus, a total of six blocks, among all three districts of the study areas were selected for the study. With the help of secondary data available at each selected blocks' headquarters, a list of the total number of villages falling under these blocks were prepared separately before during the study. On the basis of population size, all villages fall under these blocks were categorised in three groups i.e. small, medium and big villages. Further, three villages (1 small, 1 medium and 1 big village) selected randomly from each block under study (6). Thus, a total of 18 villages were selected for the study. All snapmelon growing farmers of these selected villages were listed one by one during the study and divided in three groups i.e. small, medium and big farmers (snapmelon growers). Amongst the so selected of 18 villages, two small farmers, two medium small farmers and two big farmers were selected randomly. In this way, 6 respondents (snapmelon growers) were chosen from each category of so selected villages by using random method of sampling to make total sample size of 108 respondents (snap melon growers) for the study. Further, the selected respondents were personally contacted and interviewed one by one to assess the determinants which encourage (compel the farmers to adopt and grow snapmelon crop at large scale on their fields. Simultaneously, the factors which restrain adoption and production of snapmelon crop at large scale were also collected. To find out the rank order of different determinant of growing snapmelon, were assigned with specific score as per response of the individual respondent (farmer) as was interviewed. The first determinant was assigned with highest score and last one assigned with lowest score under different groups of the factors. To measure the factors which restrain the adoption and production of snapmelon at large scale, a five-point continuum viz:, strongly disagree, disagree, undecided, agree, strongly agree, was developed and used. The score 1,2,3,4, and 5 was allotted in response of strongly disagree, disagree, undecided, agree, strongly agree, respectively. The all responses of the farmers during the survey were recorded on semi-structured interview schedule. The statistical tools like frequencies, scoring, ranking, percentage, etc. were used for analysis and drawing inferences of the study.

Results and Discussion

During the study, several determinants /factors were observed which encourage the farmers of the hot arid regions of the western Rajasthan to adopt and produce the snap melon at large scale regularly. These were grouped as economic, production and technological, socio-religious determinants and the determinants related to storage and marketing, agro-ecological aspects, etc. The major determinants responsible for large adoption and production of snapmelon in hot arid region as reported by respondents (farmers) of the study were as follows.

1. Economical determinants.

During the study, the respondents (farmers) reported several economic determinants which lead to adoption and production of snapmelon at large scale in hot arid regions western Rajasthan. The results of the study revealed that "life sustaining earning from fresh fruits of snapmelon, substantial income from dried (khelre) slice of snapmelon, plenty of land resource and family labour/manpower and low cost of cultivation with easy picking (harvesting) were major economical

determinants which encourage the farmers to grow snapmelon for large on their fields in hot arid climatic conditions which were ranked as 1st, 2nd, 3rd, and 4th by the respondents with scores 584, 504, 456 and 444, respectively as shown in Table 1.

Table 1. Economical determinants

S.No	Inspirational factors	Score (PMS* = 648)	Rank
1	Life sustaining earning from fresh fruits of snapmelon	584	1
2	Substantial income from dried (khelre) slice of snapmelon	504	2
3	Low cost of cultivation with easy picking (harvesting)	444	4
4	Low or no loss due to the attack of insects and diseases	332	5
5	Substantial income from selling of seeds	288	6
6	Plenty of land resource and family labour / manpower	456	3

*PMS = Possible Maximum Scores.

The other economical determinants found and leads to large production of snapmelon in hot arid environment of western Rajasthan were "low or no loss due to the attack of insects and diseases and substantial income from selling of seeds, etc. These results are similar to the finding of Meena, *et.al.* 2016.

2. Production and technological determinants

The other determinants which were found encouraging to e cultivate the snapmelon at large scale in hot arid regions were " low water requirement of the crop, accessibility of drought escaping local varieties, very short duration crop and easy in cultivation and harvesting" which were ranked as 1st, 2nd, 3rd, and 4th by the respondents with scores 696, 544, 506 and 468, respectively as shown in Table 2.

The other economical determinants found and leads to large production of snapmelon in hot arid environment of western Rajasthan were "high productivity of the crop, minimal land preparation requirement, high seed germination capacity, etc. Similar kin of findings were reported by Meena, *et.al.* 2009.

Table 2. Production and technological determinants

S. No.	Determinants	Score (PMS* = 756)	Rank
1	High productivity of the crop	447	5
2	Easy in cultivation & harvesting	468	4
3	Minimal land preparation requirement	412	6
4	Minimal requirement of intercultural operation	234	8
6	Accessibility of drought escaping local varieties	544	2
7	Very short duration crop	506	3
7	Low water requirement	696	1
8	High seed germination capacity	314	7

*PMS = Possible Maximum Scores.

3. Socio-psychological determinants

There were found several socio-psychological determinants during the study which inspired the farmers (respondents) to grow the snapmelon crop at large scale on their fields in different seasons. Among such determinants major were "acute shortage of vegetables and substitution for dwellers, likeness of the dwellers as a food stuff and daily dietary item, useable throughout the year in the form of dehydrated products (dry slice) and Easiness in preparation vegetable and other dishes which were ranked as 1st, 2nd, 3rd, and 4th by the respondents with scores 666, 595, 513 and 484, respectively as shown in Table 3. Maini (1997) also reported that the socio-economic reasons of growing common vegetables were to make value added products. They cited that people in dessert areas of Rajasthan grow vegetables (beans) and fruits like cluster bean, *kachri, ker, khejri, lasoda* etc. to make their value added products and as the main source of vegetables during chronic shortage of common vegetables. Thus, they were inspired to grow these vegetables to meet out their vegetable needs in adverse climatic conditions.

The other socio-psychological determinants which compelled the farmers to grow snapmelon on their fields at large scale in harsh climatic conditions of western Rajasthan as revealed during the study were "consumers were fond of its special test and flavour, has high digestive and health value, higher production viewed as high social status, etc. The similar type of the findings also reported by Singh, et.al. 2004.

Table 3. Socio-psychological determinants

S.No.	Inspirational factors	Score (PMS* = 756)	Rank
1	The likeness of the dwellers as a food stuff and daily dietary item	595	2
	Acute shortage of vegetables and substitution for dwellers	666	1
2	Consumers were fond of its special test and flavour	422	5
3	Easiness in preparation vegetable and other dishes	484	4
4	Has high digestive and health value	332	6
5	Higher production is viewed as high social status	246	7
6	Useable throughout the year in the form of dehydrated products (dry slice)	513	3

*PMS = Possible Maximum Scores.

4. Determinants related to storage and marketing aspects.

The group of determinants was related to storage and marketing aspects as revealed in table 4. The Table 4 revealed that " high demand in localities/ local markets/*mandies* (ranked 1st with score 558, the cheapest source of vegetables for all (ranked 2nd with scores 532), long shelf life of the fresh fruits at room temperature (ranked 3rd with scores 478) and easy in packing, loading-transportation-unloading (ranked 4th with scores 333) were major determinants among this group which lead to higher production of snapmelon at large scale in hot arid climatic conditions of the western Rajasthan.

Moreover, the demand of dehydrated slice (locally called *khelre*) was observed high and they have very long storage life at room temperature which also considered as determinants for large adoption and production of snapmelon in hot arid climatic conditions of western Rajasthan. The findings are in conformity of the study of Zelleke *et.al (1991) who* revealed in their study that horticultural crop production can be promoted/ increased by developing effective storage and transportation facilities, processing, marketing system, etc.

Table 4. Determinants related to storage and marketing aspects.

S.No.	Determinants	Score (PMS* = 648)	Rank
1	High demand in localities/ local markets/*mandies*	588	1
2	Easy in packing, loading-transportation-unloading	333	4
3	Cheapest source of vegetables for all	532	2
4	Long shelf life of the fresh fruits at room temperature	478	3
5	High demand of dehydrated slice (khelre) of snapmelon	292	5
6	Very long storage life of dehydrated slice (khelre) of snapmelon at room temperature	277	6

*PMS = Possible Maximum Scores .

5. Agro - ecological determinants

During the study, the respondents farmers disclosed several agro- ecological determinants wich play very important role in high adoption and growing of snapmelon at large scale in hot arid regions of the western Rajasthan. Among them major determinant factors as observed during the study were " the snapmelon is most suitable crop in existing climatic conditions, it can grow with low soil moisture/very low rainfall, has high drought tolerant & escaping capacity, it is a important component existing cropping system which were ranked as1st, 2nd , 3rd, and 4th by the respondents with scores 705, 686, 667 and 502, respectively as shown in Table 5.

Table 5. Agro - ecological determinants

S.No.	Inspirational factors	Score (PMS* = 756	Rank
1	Most suitable crop in existing climatic conditions	705	1
2	Has high drought tolerant & escaping capacity	667	3
3	Helps in soil and moisture conservation	433	5
4	Important component of existing cropping system	502	4
5	Can grow with low soil moisture/very low rainfall	686	2
6	Creates suitable micro-climate in crop fields	334	7
7	Add organic matter and increase soil fertility	298	6

*PMS = Possible Maximum scores.

The other agro-ecological determinants recorded during the study were "snapmelon crop helps in soil and moisture conservation and it cerate suitable micro-climate in crop fields Add organic matter and increase soil

fertility as were viewed by the respondents. The restraints in adoption and production of snapmelon at large scale in hot arid regions.

It is a well-known fact that the snapmelon is a tremendous crop grown in hot arid region of western Rajasthan at large scale and famers earn their livelihood by this crop. The crop is highly suitable in harsh and hard climatic condition of the region and the farmers of the region grow it easily with low investment. However, the farmers face some restraints (constraints) in successful quality production of snapmelon at large and commercial scale in the region. During the present study, the respondent farmers reported various restraints (constraints) which hinder the high adoption and production of snapmelon at large scale on their fields. The major such restraints as reported by the respondents during the study were; Scarcity of water, very low and erratic rainfall, occurrence of drought very frequently, very deep and poor quality of ground water, unfamiliarity with improved production technologies, lack of viable schemes and support system, poor marketing and market intelligence system and poor extension and information system which were ranked as 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, and 8th by the respondents with scores 988, 967, 912, 888, 756, 746, 634 and 600, respectively as reveals Table 6.

Table 6: Major restraints in adoption and production of snapmelon at large scale

S.No.	Restraining factors	Score (PMS*= 1296)	Rank
1	Scarcity of water	988	1
2	Occurrence of drought very frequenly	912	3
3	Very deep and poor quality of ground water	888	4
4	Very low and erratic rainfall	967	2
5	Lack of standardized technique of value addition	374	11
6	Comparative net income is low	488	10
7	Unfamiliarity with improved production technologies	756	5
8	Poor extension and information system	600	8
9	Lack of viable schemes and support system	746	6
10	Poor transportation and linkage system	523	9
11	Inadequate supply of electricity	311	12
12	Poor marketing and market intelligence system	634	7

*PMS= Possible maximum score.

The other restraints, observed during the study were, poor transportation and linkage system, comparative net income is low, lack of standardized technique of value addition, inadequate supply of electricity, etc which were considered responsible for low adoption and production of snapmelon in hot arid climatic conditions of the western Rajasthan. These findings are in conformity of the findings of Magray et. al., 2014.

The present study revealed that there were several economical, production and technological, socio-psychological, storage and marketing and agro-ecological determinants factors which encourages the farmers for adoption and production of snapmelon at large scale in hot arid agro-ecosystem of Western Rajasthan. During the study it was also found that the farmers face some restraints in successful quality production of snapmelon at large and commercial scale in the region. During the present study, the respondent farmers reported various restraints which hinder the high adoption and production of snapmelon at large scale. These restraint factors should be kept in mind while preparing ant research and developmental programme for large scale production of snapmelon in hot arid climatic conditions of the country. Therefore, suitable strategies and action plan should be prepared to combat the harmful restraints so that farmers can able to produce snapmelon at large scale.

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