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Reasons behind the fruit drop in oranges and removal of orchards

Preeti R Datir, VS Tekale and SG Bharad

Abstract
Maharashtra is the one of the largest producer of orange in the country. The Nagpur mandarin orange is one of the most important fruit crops of Maharashtra. The famous Nagpur orange (mandarin) is grown in humid tropical Vidarbha region of Maharashtra where summer temperature reaches as high as 45-46 ºC. But orange cultivated area is plagued with various problems due to limiting growing conditions, limiting water resources and high incidence of pests and diseases warranting great care from planting till the plants come to bearing in order to sustain a productive life of a minimum of 15-20 years hence research objective was formulated to identify the reasons behind the fruit drop in oranges and removal of orchards as perceived by orange growers. The present study was conducted in Amravati and Nagpur districts of Maharashtra state where orange is grown on large scale. The ex-post-facto research design of social research was used with 300 respondents and analyzed by frequency and percentage. The findings noted that in case of reasons behind fruit drop in oranges, majority of the respondents (97.33%) expressed reason that fruit drop due to abiotic factors like high temperature with water stress for longer duration. fruit drop due to the reason high humidity said by 94.33 per cent of the respondents and 88.00 per cent of them perceived reason behind fruit drop was due to Phytopthora (Dinkya) while major reasons behind removal of orchard as perceived by respondents were unsatisfactory market price to oranges (97.67%) and high cost of cultivation and interculture operations (86.04%). The findings revealed that lack of technical orchard management and recommended package of practices.

Keywords: Fruit drop, reasons, orange growers, farmers, removal, orchards

Introduction
Orange (*Citrus reticulata*) is most common among citrus fruits grown in India. It occupies nearly 40 percent of the total area under citrus cultivation in India. Maharashtra is a second largest producer of citrus and contributes 15.8 per cent of citrus to the total production of citrus in the country. The orange is one of the most important fruit crops of Vidarbha region of Maharashtra. Vidarbha region is known to the entire world for its awesome quality of oranges. State produces 1.76 m MT of citrus from an area of 0.28 m ha having productivity of 6.4 MT/ha. State is producing about 22 per cent of total production of mandarin orange in the country. State produces 0.74 m MT of mandarin orange from an area of 0.14 m ha with productivity of 5.5 MT/ha. It is a glorious natural gift to major orange producing belt is in the Vidharbha region of the Maharashtra state covering the Districts of Nagpur, Akola, Amravati, Wardha, Yavatmal, Buldhana and Washim. The main variety grown is Nagpur mandarin and Kinnow. The area, production and productivity of mandarin orange in Maharashtra state is 107.32 thousand ha., 797.95 million tonnes and 7.43 mt/ha, respectively and contributes 15.64 per cent share in India. Amravati and Nagpur district contributes about 84 percent of total area under orange orchards in Maharashtra state. Nagpur mandarin is one of the best mandarins in the world. Orange is rich in vitamin C, A, B and phosphorus. Orange is consumed fresh or in the form of juice, jam, squash and syrup. It is the main source of peel oil, citric acid and cosmetics which have international market value.

The citrus yield is projected to be 20.59 million tonnes (Table 1) with productivity of 15-16 tonnes/ ha by 2050. Accordingly, the per capita availability of citrus fruit will be 12.65 kg. But citrus cultivation in India is plagued with various problems due to limiting growing conditions, limiting water resources and high incidence of pests and diseases warranting great care from planting till the plants come to bearing in order to sustain a productive life of a minimum of 15-20 years. There is growing interest and awareness among the citrus growers for adoption of latest technologies for commercial cultivation of citrus.

The present study focused on the reasons behind the fruit drop in oranges and removal of orchards as perceived by orange growers while orange cultivation throughout the year. The agro-ecological conditions of the Vidarbha region of Maharashtra are best suited for the orange fruit production. Orange cultivation has proved boon for the growers due to its higher economic productivity as compared to other crops in the area. However since, last three to four years orange growers are facing very serious problem of orange fruit drop due to different abiotic, physiological, pathological, entomological and other management factors. These reasons differ according to particular region in the both Amravati and Nagpur district. According to Director of Central Citrus Research Institute (CCRI), M.S. Ladaniya [3], a reason for reduces production. Orange is known as horticultural crop alternate between 'on and off' years. Alternate years the crop is good or less due to physiological condition. If farmer dosen't give enough nutrition in the dull year, production is bound to fall. Ambia crop is an irrigated crop compared to mrig crop. Due to weather conditions, there has been an acute shortage of water resulting in less production. This study is essential to know the reasons behind the major issue regarding fruit drop in orange due to which orange growers are worried and getting lower yield and moving towards removal of orchards. Therefore, the study was conducted with objective to identify the reasons behind the fruit drop and removal of orchards as perceived by orange growers.

Materials and Methods

An ex-post-facto research design of social research was used for present study. The present research investigation was carried out in Amravati and Nagpur districts of Vidarbha region of Maharashtra state. For the proposed study, reasons behind fruit drop purpose 300 respondents 150 orange growers from Amravati district and 150 orange growers from Nagpur district were selected. Total 300 orange growers were selected purposively by simple random sampling method from 30 villages of six selected talukas namely; Warud, Morshi and Achalpur from Amravati district and Katol, Kalmeshwar and Narkhed from Nagpur district on the basis of maximum area under orange cultivation. The 43 orange growers were selected who removed orchard due to various reasons from Chandurbajar taluka of Amravati district from villages namely, Tondgaon, Jasapur, Madhan, Belaj and Talegaon Mohana and Mhasepathar, Budhala, Madasawangi villages from Kalmeshwar taluka and Yerla from Narkhed taluka from Nagpur district. These 43 orange growers were considered as respondents to identify reasons behind removal of orchard.

The data were collected by personally interviewing the purposively selected respondents with the help of structured interview schedule. Interview for data collection with the help of interview schedule was generally conducted at the orange grower's farm and occasionally also at their houses when they were free to talk with researcher. For ascertaining the reasons, respondents were asked to respond by mentioning the reasons behind the fruit drop and reasons behind the removal of orchards as perceived by orange growers as per their severity. The data were filled in excel and the frequency and percentage of each reason was worked out for interpretation.

Result and Discussion

Reasons are the logical formation of judgements by thinking and understanding by orange grower about cause of fruit drop and removal of orchard. Reasons play important role to identify the barriers in successful implementation of technologies.

The reasons were calculated by calculating frequency and percentage for each reason to study the performance of reasons into numerical scores. The besides frequency distribution, reasons are arranged based on their severity from the point of view of the respondents.

Table 1: Distribution of respondents according to reasons behind fruit drop in oranges as perceived by orange growers

Sl. No.	Statements	Respondents (n=300)	
		Frequency	Percentage
A	**Abiotic reasons/Natural calamities**		
1	High temperature with water stress for longer duration	292	97.33
2	High humidity due to continuous rainfall	283	94.33
B	**Biotic reasons**		
A	**Pathological fruit drop**		
3	Fruit rot (Due to fungus)	236	78.67
4	Greening disease	133	44.33
5	Root rot	178	59.33
6	Phytopthora (Dinkya)	264	88.00
7	Dieback (Shendemar)	238	79.33
B	**Entomological fruit drop**		
8	Fruit flies (Fal mashi)	223	74.33
9	Fruit sucking moths	250	83.33
10	White fly and black fly (Kolshi)	104	34.67
C	**Other management factors**		
11	Physiological fruit drop due to hormonal imbalance	117	39.00
12	Nutrient deficiency	196	65.33
13	Ineffective water management during Ambiya Bahar (Type of irrigation used)	218	72.67
14	Poor drainage due to improper site selection/ unsuitable soil	104	34.67
15	Declining sources of water & ground water level	146	48.66

*Multiple reasons were reported by the respondents

To secure better result of any extension service it is very essential to cut back on the reasons. Satisfaction of the intended respondents is more important. Therefore, it is important to study reasons perceived by respondents while cultivation of orange. In present study, reasons as perceived by orange growers while cultivation of orange and deriving economic benefits from it were grouped into two major categories namely; abiotic reasons and biotic reasons and has been depicted in Table 1.

The data regarding reasons behind fruit drops in oranges as perceived by orange growers were presented in Table 1, it was observed that great majority of the respondents (97.33%) expressed reason that fruit drop due to abiotic factors like high temperature with water stress for longer duration. The input cost is very high for orchard management and interculture operations so extra cost for artificial maintainance of temperature by planting shelter trees is not affordable or possible by orange growers. The 94.33 per cent of the respondents said fruit drop due to the reason high humidity, continuous rainfall were the same for all over study area as they were facing the unfavourable weather conditions which are out of human control due to which orange growers were desperated as they are not getting expected yield and better market prices. and suggested to provide proper subsidies to get economic help and design suitable policies to withstand the orange growers in such conditions.

In case of biotic factors, most of the respondents (88.00%) perceived reason behind fruit drop was due to Phytopthora (Dinkya) followed by entomological fruit drop, fruit sucking moth (83.33%), dieback (Shendemar) (79.33%), fruit rot (78.67%), fruit flies (Fal mashi) (74.33%), ineffective water management during Ambia Bahar (72.67%), nutrient deficiency (65.33%) which was observed by respondents through regular observation of symptoms on leaves, stem, fruits and other parts of tree, this was followed by root rot (59.33%), these were the major reasons of fruit drops in orange cultivation responded by majority of the respondents. The reasons of the fruit drop expressed by respondents were declining sources of water and ground water level (48.67%), greening disease (44.33%), physiological fruit drop due to hormonal imbalance (39.00%), white fly and black fly (34.67%) and poor drainage due to improper site selection ((34.67%), respectively.

In case of pathological fruit drop it was observed that fruit rot due to fungi, greening disease, root rot, phytopthora (Dinkya) and dieback (Shendemar) were the pathological causes of fruit drop in orange experienced by the respondents in the study area respectively. Fruit flies, fruit sucking moths, and white fly and black fly (Kolshi) were the major entomological cause of fruit drop as perceived by the respondents. All the causes of fruit drop in orange are interlinked with each other due to different biotic, abiotic and physiological factors. The infestation of bark eating catterpiller was observed in some cases where the ignorance towards proper orchard management due to engagement in some another job. The attack of *kolshi* i.e., white and black fly was observed in Katol and Kalmeshwar tahsil in major proportion whereas, the greening disease was observed in Chanduebajar tahsil.

Poor drainage due to improper site of selection was observed significantly in Chandurbajar tahsil. Similarly, ineffective water management practices and decreasing ground water level was observed significantly in Kalmeshwar and Narkhed tahsil respectively. In Amravati district, talukas ranking for major fruit drop were Chandurbajar, Achalpur, Morshi and Warud respectively. All these are most severe reasons in Amravati district as compared to Nagpur in case of pest and disease attack.

The findings were supported by findings of Kumar *et al.* (2018) [2], Anita Deshmukh (2019) [1], Lalit (2019) [4], Ratanpal *et al.* (2019) [5] and Venugopalan (2019) [6].

Table 2: Distribution of respondents according to reasons behind removal of orchard

Sl. No.	Statements	Respondents (n=43)	
		Frequency	Percentage
1	Unsatisfactory market price to oranges	42	97.67
2	High cost of cultivation and inter culture operations	37	86.04
3	Unavailability of water at appropriate time	27	62.79
4	Prefer to grow other crops instead of orchard	12	27.90
5	Decision in frustration	08	18.60
6	Old age of orchard	03	6.98

Chandurbajar was the only tahsil in Amravati district in which selected villages were observed from which some farmers removed their orchard namely; Jasapur, Madhan, Tondgaon, Talegaon Mohana and Belaj. From Kalmeshwar tahsil of Nagpur district, villages namely, Madasawangi, Budhala and Mhasepathar whereas, Yerla village from Narkhed tahsil orange farmers were observed from which some farmers removed their orchard. Thus, total 43 farmers were selected who removed orchard due to various reasons. The data were obtained from 43 orange growers regarding removal of orange orchard and presented in Table 2.

From the data in the Table 2 it can be interpreted that great majority of the respondents (97.67%) had given the reason behind removal of orchard were, unsatisfactory market price to oranges, followed by high cost of cultivation and interculture operations (86.04%), unavailability of water at appropriate time (62.79%), prefer to grow other crops instead of orchard (27.90%), decision in frustration (18.60%) and old age of orchard (6.98%) respectively. These are the reasons of removal of orange orchard expressed by orange grower respondents.

I the light of results obtained from this investigation; it can be interpreted that unsatisfactory market price to oranges was the major reason behind removal of orchards. As the orchard cultivation is a long-term process and can not be done in days which requires major financial investment for its maintenance. When yield is reduced to such an extent that whole orchard becomes non-economical due to various reasons. The orange growers are not getting profitable market prices due to various factors; like market demand and required orange quality, higher input cost which takes long term investment, inadequacy of water at required time, due to higher input costs and considering present status of orange orchards some of the orange growers moving towards

cultivation of other suitable crops, Due to unavoidable situations while growing orange crop like inputs and orchard management cost, drastic reduction in market rates of oranges, some of them decided to remove orchards in frustration. Involuntarily, orange growers shifted towards growing other crops due to these unavoidable reasons in the study area.

Suggestions to overcome fruit drop and removal of orchard

It can be suggested as control measures on orange fruit drop that, orange growers should try to follow cent per cent of the suggested recommended doses of fertilizers and insecticides and other recommendations given by experts for cultivation of orange crop. They should take benefit of various online workshops through social media organized by agriculture research stations in every month. In some cases the services felt unreach to the orange growers that can be managed by increasing number of staff or experts. Beside this, orange grower himself should be aware and concentrate on technical orchard management.

Conclusion

From the findings of abiotic and biotic reasons behind the fruit drop in oranges it is concluded that, majority of respondents expressed reason that fruit drop due to abiotic factors like high temperature with water stress for longer duration, high humidity due to continuous rainfall and biotic factors like Phytopthora (Dinkya), Fruit sucking moths and other management factors like ineffective water management during Ambiya Bahar. Unavailability of favourable weather conditions favours the attack of different pest and diseases due to which major fruit drop occurs in oranges in addition to ineffective management practices. As the orange is main source of income in the study area orange growers were not getting satisfactory income from orange and unfortunately they some of them were moving towards removal of orchards because of different reasons. It emphasizes the need of proper attention towards technical orange cultivation by orange growers, scientists and government by taking needful action on reduction of these reasons. The study recommends that the orange growers should be made aware about abiotic and biotic factors causing major fruit drop and better solutions and motivated to adopt recommended and modified farm management practices to earn maximum returns and quality production with minimum loses and cost and thereby increasing economic status of orange growers.

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