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Prospects of Sweet (*Citrus sinensis*) and Mandarin (*Citrus reticulata*) Orange Cultivation at Panchagarh District of Bangladesh

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Abstract: The present study was carried out through the period of 1999-2000, to investigate the future prospects of orange cultivation in the Panchagarh region of Bangladesh. The study revealed that the Panchagarh district is endowed with favorable environmental conditions for the growth and development of sweet orange/ mandarin production.

Key words: Mandarin orange, Panchagarh, Bangladesh

Introduction

Orange is a very important and popular fruit in the world. But Bangladesh has not yet been given due attention for cultivation of the fruit. Recently, an attempt was made to make a critical analysis of the situation. Sylhet is known to be the orange producing district in Bangladesh, although a very small amount of orange is produced there commercially. Most of the oranges available in our market are from abroad. Recently some farmers, public sectors and NGOs have started cultivating orange in Panchagarh district. A survey was done in Sylhet and Panchagarh districts during the period of 1998-99 (Islam, 1998). Some elite persons in the area have a few orange plants in their home garden since 1960. They are getting fruits from the plants. Their opinion is positive for successful cultivation of orange in these regions (Anonymous, 1998). For successful orange cultivation it needs uniform and reasonably deep and fertile soil with internal drainage system and free from injurious salt. The optimum pH for citrus soil ranges from 5.5-6 (Bose and Mitra, 1990). Considering the above points we have taken up this research program with the purpose to review the justification of orange cultivation and awareness of researchers and later farmers in this agro-ecological region.

Environmental factors: Climate is the deciding factor for success or failure of a given crop at a given place. Therefore, one should give utmost importance to it. The performance of orange production is the best in subtropical environment, and hence they are mostly categorized under the sub-tropical fruit crops (Rajput and Haribabu, 1985).

Temperature: Temperature is the most potential factor influencing the performance of citrus. Citrus endures both maximum and minimum temperatures up to an extent. The endurance varies with different species.

Maximum temperature: Citrus can not endure higher than 50°C. Sweet orange (*Citrus sinensis*) can be grown successfully at temperature up to 46 °C. Above this temperature, the fruits on the outer side of the tree canopy especially of sweet orange and mandarin may get heat injury to some degree and rendered worthless. Also low temperature and high winds may cause low set of fruits.

Minimum temperature: Any temperature below freezing (0°C) is dangerous for citrus. Flowers and fruits are sensitive to frost conditions and shed within a very short time under low temperature.

Growth temperature: The best growth occurs at about 32 °C. Fruit maturation including production of sugars and

development of attractive rind colour reaches its highest perfection in the lower range of growth temperature.

Relative humidity: Relative humidity has a greater role for performance of citrus production. In general, low humidity gives good colour and external appearance, whereas high humidity favours the production of thin skinned, juicy fruits, which are smaller in size but high in quality. Citrus fruits grown in partial shade are uniform in size, smooth in texture of skin and are attractive. Fruits grown in coastal areas tend to be more spherical than those grown in interior. The mandarin can tolerate more humidity in summer and winter seasons. Sweet orange requires dry and arid conditions with distinct summer and winter seasons and fairly wide variation between day night temperatures. In this condition trees grow well and produce fruits that are in excellent quality. Under heavy rainfall, fruits become poor in keeping quality and inferior in taste (Samson, 1986). Attack of various diseases and pests is also high under heavy rain conditions.

Rainfall: An annual rainfall of 700mm is said to be adequate for the production of orange. An annual rainfall of 1250-1850 mm is generally regarded as sufficient (Anonymous, 1998).

Winds: Exposure to strong winds whether hot or cold is harmful for orange. Windbreaks are generally provided in windy areas.

Altitude: The commercial orange production areas of the world are located at moderate elevation, ranging from slightly above sea level to 450-750m.

Soil: Citrus grows well on a wide variety of soils, from coarse sand to heavy clay. Water logging condition is not favorable for the plants. It is generally agreed that the best soil for citrus is a medium textured soil of recent alluvial origin.

Methodology of studying climatic and soil conditions of Panchagarh: The climatic conditions of Panchagarh were studied by collecting the data from meteorological department of Dinajpur district, Bangladesh. The data were averaged according to the nature of climate and discussed it. The soil data were collected from Soil Resource Development Institute, Bangladesh and are discussed in this paper.

Observed results of the study

Temperature: The average annual temperature of Panchagarh district ranges between 25.5-33.1 °C. Temperature starts to fall down below 20°C after the 3rd week of October and a cooler weather close to 15°C prevails up to 90-110 days. The mean number of days with exceeding 40°C is less than 7 days.

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Appendix 1: Monthly rainfall of Panchagarh (mm)

Month	1992	1993	1994	1995	1996	1997
January	3	27	38	1	17	16
February	18	1	20	12	18	24
March	-	22	14	1	-	21
April	38	130	90	31	21	42
May	188	173	324	156	463	90
June	121	317	461	592	329	
July	534	823	173	928	1201	
August	584	569	461	518	578	
September	188	374	137	595	205	
October	73	270	6	36	30	
November	-	-	-	14	-	
December	19	-	-	1	-	
Total	1,766	2,706	1,724	2,885	2,862	

Source: Deputy Director, Dept. of Agricultural Extension, Panchagarh, 1997.

Rainfall: The mean annual rainfall is 2700-3000mm, which is evenly distributed nearly for six months of the year. High relative humidity is found always in Panchagarh district.

Topography: Topography in most parts of the Panchagarh district is elevated, 60-85m high from sea level, well drained and free from normal flood hazards.

Soil conditions: The texture of the soil of Panchagarh district is mainly deep sandy loam to sandy clay loam. The topsoil and subsoil are friable / porous and rapidly permeable with a moderate moisture holding capacity. Most of the soils are acidic with a decreasing tendency towards the subsoil (FAO, 1988). Many parts of the area are above the normal flood level, and some parts are shallowly flooded in the rainy season. In the dry season, the rainfall remains below normal. Irrigation can be done with less cost, as there is an ample available ground water at shallow or moderate depth.

Discussion

The soil of Panchagarh is very favorable for orange production, as the soil is sandy loam to sandy clay loam that helps to develop good root system. The optimal soil pH for citrus ranges from 5.5-6, which is also found in the soil of Panchagarh. Acidity of the soil decreases from top soil towards depth of subsoil. The soil of Panchagarh is free from injurious salts and rapidly permeable, which provide the favorable atmosphere for the growth and development of mandarin and sweet orange (FAO, 1988). Mandarin orange or sweet orange cannot endure 0 or 50 °C. At this low and high temperature, the flowers of oranges are shed and fruits get heat injured respectively. The optimum temperature is 32°C for normal growth and development, but up to 46°C the crop grow well. In Panchagarh the temperature never appear as low as 0 °C or as high as 50 °C. The low temperature close to 10°C remains 25-35 days in winter and 40°C prevails less than for 7 days in summer. The average annual temperature is 25.5-33.1°C, which is well adjusted to the optimal temperature for vegetative and reproductive growth of orange. The annual rainfall requirement for orange cultivation in Panchagarh district is satisfactory. An annual rainfall of 1250-1850mm is generally regarded as sufficient for orange cultivation. The annual rainfall of Panchagarh district is 1724-2885mm, which is more than sufficient for its fruit set and juiciness (Appendix-1). In rabi season, the crop can be irrigated to fulfill the water requirements. One of the most important requirements of orange cultivation is dry and arid condition and a fairly wide variation between day and night temperature. In Panchagarh, during rabi season dry and arid conditions prevail due to low rainfall and also wide variation occurs between day and night temperature. In kharif season, there is high temperature, but due to a relatively high elevation (60-85m from sea level) the soil remains well drained and free from normal flood hazards.

Information regarding mandarin orange at Atwary and Boda area of Panchagarh district (Anonymous, 1998) revealed that some enthusiastic farmers are producing oranges in their homestead garden. The farmers are consuming the fruits themselves as well as selling to the local markets. There are a number of mandarin orange growers in Panchagarh district, who have 1-4 plants (Islam, 1998). The plants are matured and producing good quality fruits. Various workers (Anonymous, 1998) reported that the essential elements needed for mandarin orange production is available in the soil of Panchagarh and Thakurgaon districts, and no harmful element has been found for the growth and development of mandarin orange cultivation. The authors have visited the newly planted grafted mandarin orange orchard of the Local Government and Engineering Department (LGED) in the area, and found the plants at blooming stage with considerable number of branches. The workers in the orchard were pruning the flower buds, limiting to get 2-4 fruits in each plants (Hossain, 1999). They also visited Md. Sirajul Islam's residence at Jalashi Mor of Panchagarh, who has an orange plant at his homestead garden. He informed that he was harvesting a good number of orange from the tree with good quality. The authors also talked with the extension officer, Mr. Md. Mominul Islam. He said that during his tenure as a Deputy Director of Agricultural Extension Department in Panchagarh, found there were a lot of mandarin orange plants in the homestead garden of many farmers, which were yielding fruits of good quality. He also opened that farmers are very much interested for commercial production of orange in Panchagarh area.

Recommendation and conclusion: The preliminary investigation on the possibility of commercial production of mandarin and sweet orange in orchard, needs some scientific investigation particularly on the evaluation of some germplasm in different places of Panchagarh district, so that suitable varieties can be selected before establishing large orange orchards in this area. The germplasm may be collected from the neighboring countries and tested in this region. A study can also be done on the selection of good rootstock for mandarin orange production. The research organizations, NGOs, Universities can under take necessary steps. The views of foreign experts can also be incorporated to fulfil the objective of orange cultivation in Panchagarh region. It can be concluded that the climatic and soil conditions of Panchagarh area are favourable for the growth and development of orange and mandarin plants and production of good quality fruits. The enthusiastic growers can be motivated to establish small orange orchards using a recommended variety suitable for this region.

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