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Studies on physico-chemical properties of physiologically disordered nagpur mandarin fruits

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Abstract
Problem of fruit oblongation arises in nagpur mandarin fruits from last decades and it is dominantly increasing from last 4 to 5 years in nagpur mandarin growing regions of Akot, Amravati, Wardha, Nagpur and some part of Madhya Pradesh. The present investigation was carried out at Post Harvest Technology Laboratory, Department of Horticulture, Dr PDKV, Akola in order to study the physico-chemical characteristics of physiologically disordered nagpur mandarin fruits. Samples of physiologically disordered fruits and normal fruits were collected from twenty-five orchards of five different locations (viz., Ruikhed, Anjangaon, Paratwada, Jittapur, Akot). It was found that the physiologically disordered fruits have low TSS (5.45 to 7.82 º Brix), ascorbic acid (8.43 to 14.97 mg 100 ml $^{-1}$), reducing sugars (1.96 to 2.75%), non-reducing sugars (2.33 to 3.65%) and juice content (34.15 to 47.36%) with more acidity (0.73 to 0.80%), length breadth ratio (1.10 to 1.20), rind thickness (3.57 to 3.98 mm), pomace content (24.68 to 28.35%) and rag content (11.31 to 13.65%) as compared to normal fruits TSS (9.46 to 12.78 º Brix), ascorbic acid (32.15 to 42.57 mg 100 ml $^{-1}$), reducing sugars (3.15 to 4.75%), non-reducing sugars (4.26 to 5.56%) juice content (49.16 to 52.24%), acidity (0.64 to 0.69%), length breadth ratio (0.85 to 0.90), rind thickness (3.57 to 3.98 mm), pomace content (24.68 to 28.35%) and rag content (11.31 to 13.65%) respectively.

Keywords: Nagpur mandarin, physico-chemical, physiological disorder, fruit oblongation

Introduction
India ranks 3rd in world production of citrus with an area of 10.78 million hectares (14.9% of total fruit area) and production of 11.14 million tonnes (12.5% of total fruit production) with a productivity of 10.30 tonnes/ha (NHB, 2014). Nagpur mandarin (*Citrus reticulata* Blanco) is the principal citrus fruit grown commercially in central India covering an area of 0.135 million ha (40.9%) and an estimated production of 7.42 million tonnes (21.61%) with a productivity of 5.5 tonnes/ha (NHB, 2014). It is highly prized and economically remunerative fruit. Mandarin fruits have special importance due to their distinct flavors and therapeutic values. These are rich in vitamin-C with fair amounts of vitamins A & B. Besides this, they are rich source of minerals (calcium, phosphorus and iron).

Materials and methods
The study was carried out at Post-harvest Technology Laboratory, Department of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2018-19 on *Mrig bahar* fruits of nagpur mandarin. Twenty-five nagpur mandarin orchards located at different locations in Vidarbha viz., Ruikhed, Jittapur and Akot from Akola district, Anjangaon and Paratwada from Amravati district were selected for study. The effect on fruit shape, size and quality etc were observed. Physiologically disordered and normal Mrig crop fruits were collected at maturity in the month of February 2018 from Ruikhed, Anjangaon, Paratwada, Jittapur and Akot subjected to physicochemical analysis. Ten fruits weighing 135 to 150 (g) were sampled from 10 trees uniformly from all the sides of each tree and average fruit weight (g) was recorded. The fruits of different size and nearly same maturity were selected by visual observation for sampling. Statistical analysis was done by subjecting the data two sample t-test (Panse and Sukhatme, 1985) [7] with five number of observations as presented in (Graph 1-10).

Results and discussion

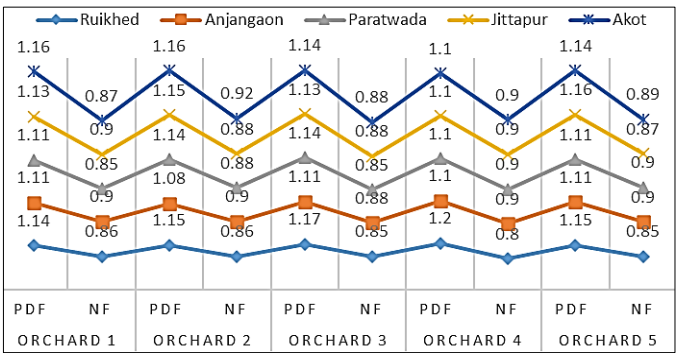
The onset of the disorder started at the peak rainy season in July and August and aggravated beyond controllable proportions by September end just before physiological fruit maturity. The stem attachment of the fruits developed pinkish/reddish tissues on the button albedo partially choking the supply of photosynthates that's how this disorder is also called locally as 'Cock bund' (literally meaning 'tap closed'). Since the fruits did not drop down and only failed to develop into normal shape/ size/volume and internal quality, it seems that the movement of photosynthates is blocked and only xylem transport probably ensures water supply to the fruits thereby making them sour and insipid.

Fruit physical properties

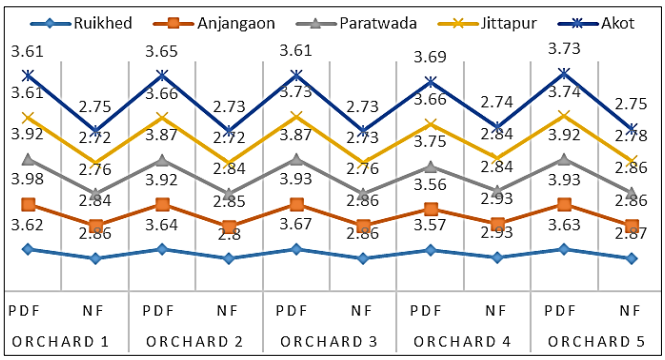
Data presented in (Graph 1) represent that the length-breadth ratio was more in physiologically disordered fruits (1.10 to 1.20) as compared to normal fruits (0.85 to 0.90). Increased length-breadth ratio leads to oblong fruit shape. Higher fruit length breadth ratio leads to the oblonged fruits. The fruits fetched no price from the contractors as well as in the retail market. Since the extent of damage went to the tune of 40-50% of the total produce. Such fruits incur heavy economic losses to the farmers in the affected pockets. Micro-nutrient helps to build the physical characteristic like fruit weight, length Breadth of fruits (Kumar *et al*., 2017) [6]. Deficiency of such nutrient may cause abnormality in fruit shape and size. Spray of GA3 at 100 ppm on nagpur mandarin exhibit maximum horizontal and vertical diameter of fruit. (Bhatnagar *et al*., 2012) [3]. Data Apparent in the (Graph 2) represents that rind thickness was significantly more in physiologically disordered fruit as compared to normal fruits. Decrease in rind thickness of fruit might be due to improvement in the internal developing of fruit in terms of better supply of water, nutrient and other compounds vital for their proper growth and development. Tree age has a pronounce effect on 'Kinnow' mandarin fruit quality as fruit from young trees (3-year-old) have more rind thickness (Khalid *et al*., 2012) [5]. The data presented in (Graph 3) shows that the juice content in physiologically disordered fruits (34.15 to 47.36%) was found to be less as compared to normal fruits (49.16 to 52.24%). Rag content (Graph 4) and pomace content (Graph 5) was significantly more in physiologically disordered fruits as compared to normal fruits. Rag content in fruits greatly affected by the size and inner material of fruits. Increase in juice content and increase in fruit segments reduced the rag content in fruits.

Fruit chemical properties

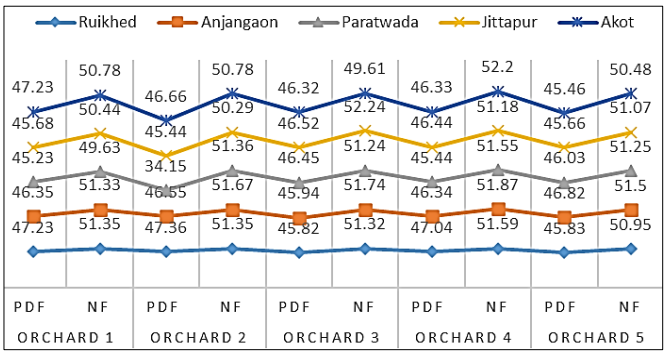
From (Graph 6) it is evident that TSS of juice is very low in physiologically disordered fruits (5.45 to 7.82 º Brix) as compared to normal fruits (9.46 to 12.78 º Brix). Higher TSS of fruit juice might be due to quick metabolic transformation of starch and pectin into soluble sugars and rapid mobilization photosynthetic metabolites and minerals from other parts of the plant. Results regarding TSS were found to be in consonance with that of (Jhade *et al.*, 2017) [4]. As marked in (Graph 7) it is clear that acidity of Physiologically disordered fruit varied (0.73 to 0.80%) was found more as compared to Normal fruits varied (0.64 to 0.69%). The average lowest acidity (0.77%) is observed in K fertigation with mono-potassium phosphate (MKP) followed by K fertigation with potassium sulphate. (Shirgure and Srivastava, 2015) [8]. TSS and acidity is an important characteristic of fruit maturity such low TSS and more acidic physiologically disordered fruits fetch very low market price causes heavy losses to the farmers. Data presented in (Graph 8) represents that ascorbic acid content in physiologically disordered fruit (8.43 to 14.97 mg 100 ml $^{-1}$) is very low as compared to normal fruits (32.15 to 42.57 mg 100 ml $^{-1}$) of nagpur mandarin. As apparent in (Graph 9 and 10) Reducing and non-reducing sugars significantly low in physiologically disordered fruits as compared to normal fruits leads to insipid taste of fruits such fruits get very low value from contractors as well as consumers.



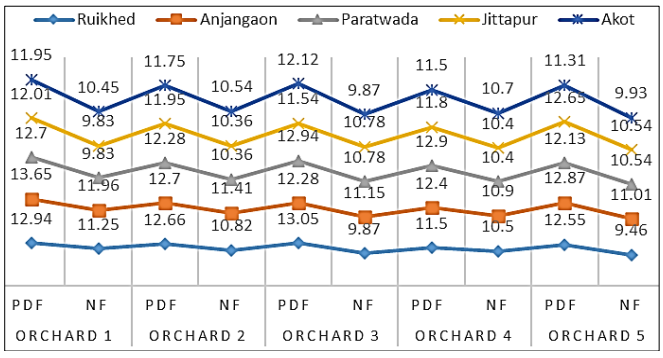
Graph 1: Length breadth ratio



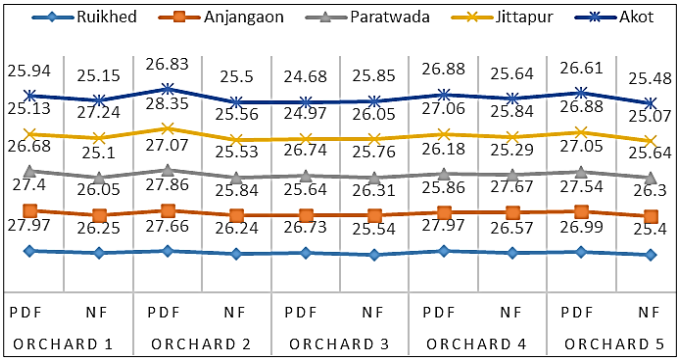
Graph 2: Rind thickness (MM)



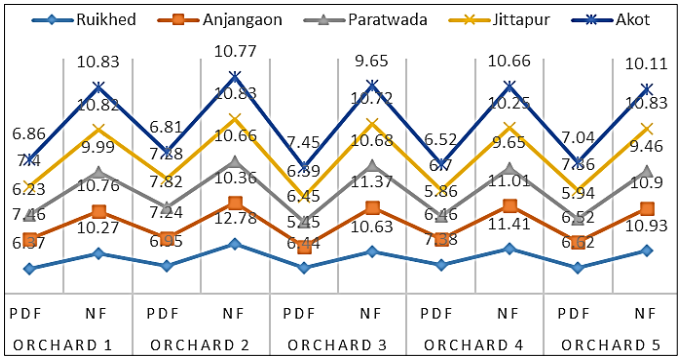
Graph 3: Juice content (%)



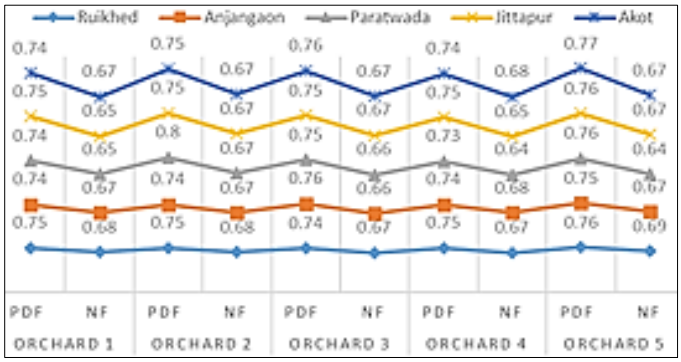
Graph 4: Rag Content



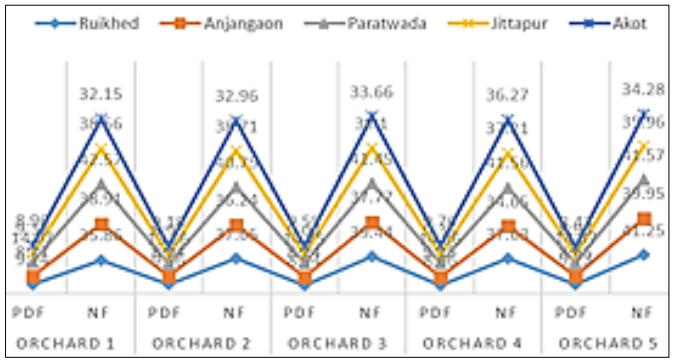
Graph 5: Pomace content (%)



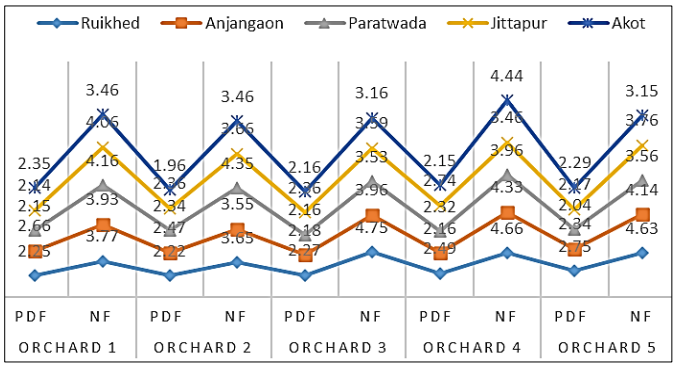
Graph 6: TSS (^{O} BRIX)



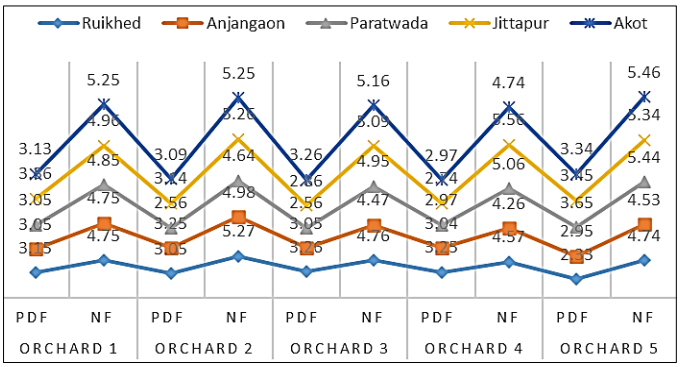
Graph 7: Acidity (%)



Graph 8: Ascorbic acid (mg/100 ml)



Graph 9: Reducing sugars (%)



Graph 10: Non-Reducing sugars (%)

Note: (PDF- Physiologically disordered fruit) (NF- Normal fruit)

Physiologically disordered nagpur mandarin fruits collected from different locations.

Conclusion

In physiologically disordered fruits, the fruit length: breadth ratio was more as compared to normal fruits of nagpur mandarin. Physiologically disordered fruits were more acidic with low TSS greatly reduces the quality of fruits. Rind thickness, pomace content, rag content was observed more in physiologically disordered fruits. Reducing sugar and non-reducing sugar in physiologically disordered fruits was less as compared to normal fruits of nagpur mandarin.

References

1. Anonymous. Citrus newsletter ICAR-CCRI, 2015.

2. Anonymous. Indian Horticulture Database, 2014.
3. Bhatnagar S, Jain MC, Singh B, Manmohan JR, Dashora LK. Studies on seasonal variations in developing fruits of Nagpur Mandarin (Citrus reticulate Blanco) under Jhalawar condition. Asian Journal of Horticulture. 2012; 7(2)263-265.
4. Jhade RK, Huchche AD, Ladaniya MS, Jain PK. Waywar (Oblong Fruit): A Menacing Fruit Disorder in Nagpur Mandarin (*Citrus reticulata* Blanco). Advances, 2017, 3793.
5. Khalid S, Malik AU, Khan AS, Jamil A. Influence of exogenous applications of plant growth regulators on fruit quality of young Kinnow mandarin (*Citrus nobilis* × *C. deliciosa*) trees. Int J Agric Biol. 2012; 14:229-234.
6. Kumar R, Bakshi M, Singh DB. Influence of plant growth regulators on growth, yield and quality of Nagpur mandarin. Asian J. Hort. 2017; 7(2):434-436.
7. Panse VG, Sukhatme PV. Statistical methods for agricultural research. ICAR, New Delhi, 1985.
8. Shirgure PS, Srivastava AK. Evaluation of drip irrigation emitters arrangement and its effect on soil moisture, leaf nutrients, yield and quality of Nagpur mandarin (*Citrus reticulata*). Indian Journal of Agricultural Sciences. 2015; 85(12):1586-91.