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Original Research Article

Correlation Dynamics among Growth, Leaf Nutrient Status and Fruit Physical Parameters in Response to Plant Growth Regulators and Fertigation on Pomegranate (*Punica granatum* L.) under High Density Planting System

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A B S T R A C T

Correlation studies were determined among growth, leaf nutrient status and physical quality of pomegranate in response to use of different treatment combinations of plant growth regulators and fertigation during two successive years *i.e.* 2018 and 2019 under the Department of Fruit Science, College of Horticulture and Forestry, Jhalawar. The experiment was conducted in the pomegranate orchard established under high density planting system at the Krishi Vigyan Kendra, Jhalawar in the near vicinity of the college. The growth attributes *viz.* plant height, canopy spread, leaf area, chlorophyll, leaf nutrient content and fruit physical parameters *viz.* fruit weight, volume, aril weight and aril percent exhibited significant and positive correlation with each other. The specific gravity, rind weight, rind per cent and rind thickness exhibited significant and positive correlation with each other but negative and non significant correlation with all the plant growth parameters and most of the physical parameters of pomegranate. Correlation studies are very useful and important tool to interpret the trend and positive inter-relationships amongst morphological, physical and nutrient status of pomegranate plants.

Keywords

NAA, Ethrel, Fertilizers, Aril, Rind

Introduction

Pomegranate (*Punica granatum* L.) is one of the promising fruit crops of India. It is distinctly known in the family *Lythraceae*, which comprises only one genus (*Punica*) and two species; *P. granatum* and *P. protopunica* (Samir, 2010). It is an economically important species of the tropical and subtropical regions of the world due to its delicious edible fruits and pharmaceutical and ornamental usage. Fruit juice is a good source of sugars, vitamin C, vitamin B, pantothenic acid, potassium, antioxidant polyphenols and a fair source of iron. Wild pomegranate is too acidic and of little value except as souring agent (*Anardana*). The double-flowered pomegranates (which do not bear fruits) are grown in parks and ornamental gardens for their beautiful red flowers (Raj and Kanwar, 2008). The plant growth regulators have been used for various beneficial effects such as to modify a crop by changing the rate or pattern or both of its response to the internal and external factors that govern development from germination through vegetative growth, reproductive development, maturity and senescence or aging, promoting root growth and the number of flowers, increasing the fruit set, fruit size, quality and for inducing early and uniform fruit ripening as well as postharvest preservation (Mikal, 1999). Application of fertilizers through fertigation, improves fertilizer and water use efficiency, helps to maintain nutritional balance and nutrient concentration at optimum level, provides opportunity to apply the nutrients at critical stages of crop growth and minimizes hazard of ground water pollution due to nitrate leaching as compared to conventional practice of fertilizers application. This can be achieved by fertigation technology which involves application of fertilizer with drip irrigation system at a slow and controlled rate to the root zone (Kumar *et al.*, 2008). Plant growth regulators and fertigation are the most important inputs which directly affect the plant growth, development, yield and quality of produce. Farmers are using solid fertilizers for fruit crop production but these are not totally water soluble and hence are less available to plants and some of the fertilizers contain salts of sodium and chloride which not only affect the quality and quantity of crop production but they are also harmful to the soil.

Materials and Methods

An investigation was carried out under the Department of Fruit Science, College of Horticulture and Forestry, Jhalawar (Agriculture University, Kota). The experiment was conducted in pomegranate orchard of Sinduri (Bhagwa) variety under high density planting system (3 m × 3 m) at the Krishi Vigyan Kendra, Jhalawar in the near vicinity of the college. The experiment was laid out in Factorial Randomized Block Design and each treatment was replicated thrice and per treatment two plants were used. For this experiment, 162 pomegranate plants were selected from the block during two successive years *i.e.* 2018 and 2019. The treatments consisted of two different plant growth regulators namely NAA and ethrel, and fertigation of recommendation dose of fertilizers with three levels of each (NAA 0, 50 and 100 ppm and ethrel 0, 150 and 250 ppm) and fertigation levels (0, 75 and 100 % recommended dose of fertilizers). Recommended dose of urea, phosphoric acid and muriate of potash were applied @ 625, 250, and 250 g per plant respectively, for six years old pomegranate plants was fixed based on the recommendation given by Pareek, (1982). Water soluble fertilizers were applied through drip irrigation system (fertigation). Amount of water soluble fertilizers were determined by calculating amount of nitrogen, phosphorus and potassium in recommended dose. The plain distilled water and basal dose of fertilizers were applied on the plants for control. In this way total 27 treatments were used in this experiment. The plant growth regulators were sprayed at pre flowering and post flowering stage and fertigation were applied monthly in four equal split dose from 1 July to 1 October on both years, after recording initial (base) growth and development parameters of plants. The desired quantities of plant growth regulators and fertilizers were procured from different sources for the purpose of experiment and required quantities of these materials were applied on individual plant. Correlation analysis was done after completion of all plant growth, leaf attributes and fruit quality parameters and subsequently data were analyzed for multiple correlations as suggested by Panse and Sukhatme (1985).

Results and Discussions

Correlation among growth, leaf nutrient status and fruit physical attributes of pomegranate

The results presented in Table 1 indicated that plant height exhibited significant and positive correlation with canopy volume (r =

0.990**), leaf area (r = 0.972**), chlorophyll content of leaves (r= 0.964**), leaf nitrogen (r = 0.932**) leaf phosphorus (r = 0.936**), leaf potassium (r = 0.960**), fruit diameter (r = 0.971**), fruit weight (r = 0.979**), fruit volume (r = 0.979**), aril weight / fruit (r = 0.967**), 100 arils weight (r = 0.957**) and aril per cent. Though, plant height exhibited negative and non significant with specific gravity (r = -0.944), fruit cracking per cent (r = -0.873), rind per cent (r = -0.880), rind weight (r = -0.501) and rind thickness (r = -0.783). The attributes plant spread (East-West) exhibited significant and positive correlation with plant height (r = 0.948**), canopy volume (r = 0.977**), leaf area (0.974**), chlorophyll content of leaves (r= 0.951**), leaf nitrogen (r = 0.916**) leaf phosphorus (r = 0.926**), leaf potassium (r = 0.946**), fruit diameter (r = 0.952**), fruit weight (r = 0.953**), fruit volume (r = 0.955**), aril weight / fruit (r = 0.974**), 100 arils weight (r = 0.975**), aril per cent (r = 0.958**). However, plant spread (East-West) exhibited negative and non significant with specific gravity (r = -0.943), fruit cracking per cent (r = -0.944), rind per cent (r = -0.958), rind weight (r = -0.689) and rind thickness (r = -0.921). Plant spread (North-South) showed significant and positive correlation with plant height (r = 0.958**), East-West plant spread (r = 0.990**), canopy volume (r = 0.985**), leaf area (0.968**), chlorophyll content of leaves (r= 0.952**), leaf nitrogen (r = 0.911**) leaf phosphorus (r = 0.917**), leaf potassium (r = 0.941**), fruit diameter (r = 0.949**), fruit weight (r = 0.956**), fruit volume (r = 0.959**), aril weight / fruit (r = 0.978**), 100 arils weight (r = 0.975**), aril per cent (r = 0.966**). However, plant spread (North-South) exhibited negative and non significant with specific gravity (r = -0.943), fruit cracking per cent (r = -0.948), rind per cent (r = -0.966), rind weight (r = -0.698) and rind thickness (r = -0.918). This result is in consonance with the findings of Desai *et al.*, (1992) in pomegranate. The characteristic of canopy volume revealed significant and positive correlation with plant height (r = 0.990**), leaf area (0.982**), chlorophyll content of leaves (r= 0.967**), leaf nitrogen (r = 0.928**), leaf phosphorus (r = 0.934**), leaf potassium (r = 0.958**), fruit diameter (r = 0.973**), fruit weight (r = 0.978**), fruit volume (r = 0.979**), aril weight / fruit (r = 0.982**), 100 arils weight (r = 0.977**) and aril per cent (r = 0.927**). However, canopy volume exhibited negative and non significant with specific gravity (r = -0.947), fruit cracking per cent (r = -0.911), rind per cent (r = -0.958), rind weight (r = -0.689) and rind thickness (r = -0.921). The leaf area exhibited significant and positive correlation with plant height (r = 0.972**), canopy volume (r = 0.982**), chlorophyll content of leaves (r= 0.970**), leaf nitrogen (r = 0.942**), leaf phosphorus (r = 0.945**), leaf potassium (r = 0.963**), fruit diameter (r = 0.967**), fruit weight (r = 0.974**), fruit volume (r = 0.974**), aril weight / fruit (r = 0.979**), 100 arils weight (r = 0.974**), aril per cent (r = 0.923**). The studies on correlations revealed that E-W and N-S plant spread and plant height will be effective to bring rapid improvement in pomegranate for total number of fruits and yield per plant. However, leaf area exhibited negative and non significant with specific gravity (r = -0.952), fruit cracking per cent (r = -0.923), rind per cent (r = -0.923), rind weight (r = -0.601) and rind thickness (r = -0.845). The results of present findings are in conformity with those reported by Meena *et al*., (2020) in guava in most of the growth attributes.

The results presented in Table 1 indicated that chlorophyll exhibited significant and positive correlation with plant height (r = 0.964**), canopy volume (r = 0.967**), leaf area (r= 0.970**), leaf nitrogen (r = 0.983**), leaf phosphorus (r = 0.981**), leaf potassium (r = 0.991**), fruit diameter (r = 0.972**), fruit weight (r = 0.986**), fruit volume (r = 0.989**), aril weight / fruit (r = 0.985**), 100 arils weight (r = 0.974**) and aril per cent (r = 0.917**). However, chlorophyll exhibited negative and non significant with specific gravity (r = -0.959), fruit cracking per cent (r = -0.926), rind per cent (r = -0.918), rind weight (r = -0.573), rind thickness (r = -0.832). The leaf nitrogen per cent exhibited significant and positive correlation with plant height (r = 0.932**), canopy volume (r = 0.928**), leaf area (r= 0.942**), chlorophyll (r = 0.983**), leaf phosphorus (r = 0.995**), leaf potassium (r = 0.990**), fruit diameter (r = 0.953**), fruit weight (r = 0.971**), fruit volume (r = 0.972**), aril weight / fruit (r = 0.959**), 100 arils weight (r = 0.940**) and aril per cent (r = 0.869**). However, leaf nitrogen per cent exhibited negative and non significant with specific gravity (r = -0.938), fruit cracking per cent (r = -0.902), rind per cent (r = -0.493), rind weight (r = -0.573) and rind thickness (r = -0.782). Leaf phosphorus per cent exhibited significant and positive correlation with plant height (r = 0.936**), canopy volume (r = 0.934**), leaf area (r= 0.945**), chlorophyll (r = 0.981**), leaf nitrogen (r = 0.995**), leaf potassium (r = 0.988**), fruit diameter (r = 0.949**), fruit weight (r = 0.969**), fruit volume (r = 0.969**), aril weight / fruit (r = 0.958**), 100 arils weight (r = 0.939**) and aril per cent (r = 0.872**). However, leaf phosphorus per cent exhibited negative and non significant with specific gravity (r = -0.932), fruit cracking per cent (r = -0.901), rind per cent (r = -0.873), rind weight (r = -0.502) and rind thickness (r = -0.787). Leaf potassium per cent exhibited significant and positive correlation with plant height (r = 0.960**), canopy volume (r = 0.946**), leaf area (r= 0.963**), chlorophyll (r = 0.991**), leaf nitrogen (r = 0.990**), leaf phosphorus (r = 0.988**), fruit diameter (r = 0.972**), fruit weight (r = 0.980**), fruit volume (r = 0.983**), aril weight / fruit (r = 0.972**), 100 arils weight (r = 0.961**) and aril per cent (r = 0.889**). However, leaf potassium per cent exhibited negative and non significant with specific gravity (r = -0.951), fruit cracking per cent (r = -0.901), rind per cent (r = -0.890), rind weight (r = -0.524) and rind thickness (r = -0.806).

The attribute fruit diameter determined significant and positive correlation with plant height (r = 0.971**), canopy volume (r = 0.973**), leaf area (r= 0.967**), chlorophyll (r = 0.972**), leaf nitrogen (r = 0.953**), leaf phosphorus (r = 0.949**), leaf potassium (r = 0.972**), fruit weight (r = 0.987**), fruit volume (r = 0.985**), aril weight / fruit (r = 0.978**), 100 arils weight (r = 0.975**) and aril per cent (r = 0.892**). However, fruit diameter exhibited negative and non significant with specific gravity (r = -0.952), fruit cracking per cent (r = -0.883), rind per cent (r = -0.892), rind weight (r = -0.523) and rind thickness (r = -0.825). Fruit weight showed significant and positive correlation with plant height (r = 0.979**), canopy volume (r = 0.978**), leaf area (r= 0.974**), chlorophyll (r = 0.986**), leaf nitrogen (r = 0.971**), leaf phosphorus (r = 0.969**), leaf potassium (r = 0.980**), fruit diameter (r = 0.987**), fruit volume (r = 0.997**), aril weight / fruit (r = 0.990**), 100 arils weight (r = 0.978**) and aril per cent (r = 0.907**). On the other hand, fruit weight exhibited negative and non significant with specific gravity (r = -0.967), fruit cracking per cent (r = -0.919), rind per cent (r = -0.908), rind weight (r = -0.527) and rind thickness (r = -0.826). Fruit volume revealed significant and positive correlation with plant height (r = 0.979**), plant spread *viz.* East-West (r = 0.955**) and North-South (r = 0.959**), canopy volume (r = 0.979**), leaf area (r= 0.974**), chlorophyll (r = 0.989**), leaf nitrogen (r = 0.972**), leaf phosphorus (r =

0.969**), leaf potassium (r = 0.983**), fruit diameter (r = 0.985**), fruit weight (r = 0.997**), aril weight / fruit (r = 0.991**), 100 arils weight (r = 0.979**) and aril per cent (r = 0.916**). Though, fruit volume showed negative and non significant with specific gravity (r = -0.975), fruit cracking per cent (r = -0.920), rind per cent (r = -0.916), rind weight (r = -0.552) and rind thickness (r = -0.827). The characteristic specific gravity showed evidence of non significant and negative correlation with plant height (r = -0.944), plant spread *viz.* East-West (r = -0.943) and North-South (r = -0.943**), canopy volume (r = -0.947), leaf area (r= -0.952), chlorophyll (r = -0.959), leaf nitrogen (r = -0.938), leaf phosphorus (r = -0.932), leaf potassium (r = -0.951), fruit diameter (r = -0.952), fruit weight (r = -0.967), fruit volume (r = -0.975), aril weight / fruit (r = -0.969), 100 arils weight (r = -0.953) and aril per cent (r = -0.914). However, specific gravity exhibited positive and significant with fruit cracking per cent (r = 0.928**), rind per cent (r = 0.913**), rind weight (r = 0.579**) and rind thickness (r = 0.831**).

The aril weight / fruit showed significant and positive correlation with plant height (r = 0.967**), plant spread *viz.* East-West (r = 0.974**) and North-South (r = 0.978**), canopy volume (r = 0.982**), leaf area (r= 0.979**), chlorophyll (r = 0.985**), leaf nitrogen (r = 0.959**), leaf phosphorus (r = 0.958**), leaf potassium (r = 0.972**), fruit diameter (r = 0.978**), fruit weight (r = 0.990**), fruit volume (r = 0.991**), 100 arils weight (r = 0.993**) and aril per cent (r = 0.956**). However, aril weight / fruit exhibited negative and non significant with specific gravity (r = -0.969), fruit cracking per cent (r = -0.953), rind per cent (r = -0.956), rind weight (r = -0.639) and rind thickness (r = -0.885). The weight of 100 arils exhibited significant and positive correlation with plant height (r = 0.957**), plant spread *viz.* East-West (r = 0.975**) and North-South (r = 0.975**), canopy volume (r = 0.977**), leaf area (r= 0.974**), chlorophyll (r = 0.974**), leaf nitrogen (r = 0.940**), leaf phosphorus (r = 0.939**), leaf potassium (r = 0.961**), fruit diameter (r = 0.975**), fruit weight (r = 0.978**), fruit volume (r = 0.979**), aril weight / fruit (r = 0.993**) and aril per cent (r = 0.959**). However, weight of 100 arils exhibited negative and non significant with specific gravity (r = -0.953), fruit cracking per cent (r = -0.943), rind per cent (r = -0.960), rind weight (r = -0.664) and rind thickness (r = -0.902). Fruit cracking per cent exhibited non significant and negative correlation with plant height (r = -0.873), plant spread *viz.* East-West (r = -0.944) and North-South (r = -0.948**), canopy volume (r = -0.911), leaf area (r= -0.923), chlorophyll (r = -0.926), leaf nitrogen (r = -0.902), leaf phosphorus (r = -0.901), leaf potassium (r = -0.901), fruit diameter (r = -0.883), fruit weight (r = -0.919), fruit volume (r = -0.920), aril weight / fruit (r = -0.953), 100 arils weight (r = -0.943) and aril per cent (r = -0.974). However, fruit cracking per cent exhibited positive and significant with specific gravity (r = 0.928**), rind per cent (r = 0.974**), rind weight (r = 0.747**) and rind thickness (r = 0.934**). Aril per cent showed significant and positive correlation with plant height (r = 0.880**), plant spread *viz.* East-West (r = 0.958**) and North-South (r = 0.966**), canopy volume (r = 0.927**), leaf area (r= 0.923**), chlorophyll (r = 0.917**), leaf nitrogen (r = 0.869**), leaf phosphorus (r = 0.872**), leaf potassium (r = 0.889**), fruit diameter (r = 0.892**), fruit weight (r = 0.902**), fruit volume (r = 0.916**), aril weight / fruit (r = 0.956**) and 100 arils weight (r = 0.959**). Though, aril per cent exhibited negative and non significant with specific gravity (r = -0.914), fruit cracking per cent (r = -0.974), rind per cent (r = -1.0), rind weight (r = -0.830) and rind thickness (r = -0.961).

Table.1 Correlation among growth, leaf nutrient status and physical quality parameters of pomegranate in response to use of different treatment combinations of plant growth regulators and fertigation

Sr. No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	1	0.948**	0.958**	0.990**	0.972**	0.964**	0.932**	0.936**	0.960**	0.971**	0.979**	0.979**	-0.944	0.967**	0.957**	-0.873	0.880**	-0.880	-0.501	-0.783
2	0.948**	1	0.990**	0.977**	0.974**	0.951**	0.916**	0.926**	0.946**	0.952**	0.953**	0.955**	-0.943	0.974**	0.975**	-0.944	0.958**	-0.958	-0.689	-0.921
3	0.958**	0.990**	1	0.985**	0.968**	0.952**	0.911**	0.917**	0.941**	0.949**	0.956**	0.959**	-0.943	0.978**	0.975**	-0.948	0.966**	-0.966	-0.698	-0.918
4	0.990**	0.977**	0.985**	1	0.982**	0.967**	0.928**	0.934**	0.958**	0.973**	0.978**	0.979**	-0.947	0.982**	0.977**	-0.911	0.927**	-0.927	-0.596	-0.854
5	0.972**	0.974**	0.968**	0.982**	1	0.970**	0.942**	0.945**	0.963**	0.967**	0.974**	0.974**	-0.952	0.979**	0.974**	-0.923	0.923**	-0.923	-0.601	-0.845
6	0.964**	0.951**	0.952**	0.967**	0.970**	1	0.983**	0.981**	0.991**	0.972**	0.986**	0.989**	-0.959	0.985**	0.974**	-0.926	0.917**	-0.918	-0.573	-0.832
7	0.932**	0.916**	0.911**	0.928**	0.942**	0.983**	1	0.995**	0.990**	0.953**	0.971**	0.972**	-0.938	0.959**	0.940**	-0.902	0.869**	-0.869	-0.493	-0.782
8	0.936**	0.926**	0.917**	0.934**	0.945**	0.981**	0.995**	1	0.988**	0.949**	0.969**	0.969**	-0.932	0.958**	0.939**	-0.901	0.872**	-0.873	-0.502	-0.787
9	0.960**	0.946**	0.941**	0.958**	0.963**	0.991**	0.990**	0.988**	1	0.972**	0.980**	0.983**	-0.951	0.972**	0.961**	-0.901	0.889**	-0.890	-0.524	-0.806
10	0.971**	0.952**	0.949**	0.973**	0.967**	0.972**	0.953**	0.949**	0.972**	1	0.987**	0.985**	-0.952	0.978**	0.975**	-0.883	0.892**	-0.892	-0.523	-0.825
11	0.979**	0.953**	0.956**	0.978**	0.974**	0.986**	0.971**	0.969**	0.980**	0.987**	1	0.997**	-0.967	0.990**	0.978**	-0.919	0.907**	-0.908	-0.527	-0.826
12	0.979**	0.955**	0.959**	0.979**	0.974**	0.989**	0.972**	0.969**	0.983**	0.985**	0.997**	1	-0.975	0.991**	0.979**	-0.920	0.916**	-0.916	-0.552	-0.827
13	-0.944	-0.943	-0.943	-0.947	-0.952	-0.959	-0.938	-0.932	-0.951	-0.952	-0.967	-0.975	1	-0.969	-0.953	0.928**	-0.914	0.913**	0.579**	0.831**
14	0.967**	0.974**	0.978**	0.982**	0.979**	0.985**	0.959**	0.958**	0.972**	0.978**	0.990**	0.991**	-0.969	1	0.993**	-0.953	0.956**	-0.956	-0.639	-0.885
15	0.957**	0.975**	0.975**	0.977**	0.974**	0.974**	0.940**	0.939**	0.961**	0.975**	0.978**	0.979**	-0.953	0.993**	1	-0.943	0.959**	-0.960	-0.664	-0.902
16	-0.873	-0.944	-0.948	-0.911	-0.923	-0.926	-0.902	-0.901	-0.901	-0.883	-0.919	-0.920	0.928**	-0.953	-0.943	1	-0.974	0.974**	0.747**	0.934**
17	0.880**	0.958**	0.966**	0.927**	0.923**	0.917**	0.869**	0.872**	0.889**	0.892**	0.907**	0.916**	-0.914	0.956**	0.959**	-0.974	1	-1.000	-0.830	-0.961
18	-0.880	-0.958	-0.966	-0.927	-0.923	-0.918	-0.869	-0.873	-0.890	-0.892	-0.908	-0.916	0.913**	-0.956	-0.960	0.974**	-1.000	1	0.830**	0.960**
19	-0.501	-0.689	-0.698	-0.596	-0.601	-0.573	-0.493	-0.502	-0.524	-0.523	-0.527	-0.552	0.579**	-0.639	-0.664	0.747**	-0.830	0.830**	1	0.847**
20	-0.783	-0.921	-0.918	-0.854	-0.845	-0.832	-0.782	-0.787	-0.806	-0.825	-0.826	-0.827	0.831**	-0.885	-0.902	0.934**	-0.961	0.960**	0.847**	1

* Correlation is significant at the 5 % level of significance, ** Correlation is significant at the 1% level of significance

1. Plant height 2. Plant spread (East-West) 3. Plant spread (North-South) 4. Canopy volume 5. Leaf area 6. Chlorophyll 7. Leaf nitrogen 8. Leaf phosphorus 9. Leaf potassium 10. Fruit diameter 11. Weight of fruit 12. Volume of fruit 13. Specific gravity 14. Aril weight / fruit 15. Weight of 100 arils 16. Fruit cracking per cent 17. Aril per cent 18. Rind per cent 19. Rind weight 20. Rind thickness.

Rind per cent exhibited non significant and negative correlation with plant height (r = -0.880), plant spread *viz.* East-West (r = -0.958) and North-South (r = -0.966), canopy volume (r = -0.927), leaf area (r= -0.923), chlorophyll (r = -0.918), leaf nitrogen (r = -0.869), leaf phosphorus (r = -0.873), leaf potassium (r = -0.890), fruit diameter (r = -0.892), fruit weight (r = -0.908), fruit volume (r = -0.916), aril weight / fruit (r = -0.956), 100 arils weight (r = -0.960) and aril per cent (r = -1.0). However, rind per cent exhibited positive and significant with specific gravity (r = 0.913**), fruit cracking per cent (r = 0.974**), rind weight (r = 0.830**) and rind thickness (r = 0.960**). Rind weight exhibited non significant and negative correlation with plant height (r = -0.501), plant spread *viz.* East-West (r = -0.689) and North-South (r = -0.698), canopy volume (r = -0.596), leaf area (r= -0.601), chlorophyll (r = -0.573), leaf nitrogen (r = -0.493), leaf phosphorus (r = -0.502), leaf potassium (r = -0.524), fruit diameter (r = -0.523), fruit weight (r = -0.527), fruit volume (r = -0.552), aril weight / fruit (r = -0.639), 100 arils weight (r = -0.664) and aril per cent (r = -0.830). However, rind weight exhibited positive and significant with specific gravity (r = 0.579**), fruit cracking per cent (r = 0.747**), rind per cent (r = 0.830**) and rind thickness (r = 0.847**). Rind thickness attribute determined non significant and negative correlation with plant height (r = -0.783), plant spread *viz.* East-West (r = -0.921) and North-South (r = -0.918), canopy volume (r = -0.854), leaf area (r= -0.845), chlorophyll (r = -0.832), leaf nitrogen (r = -0.782), leaf phosphorus (r = -0.787), leaf potassium (r = -0.806), fruit diameter (r = -0.825), fruit weight (r = -0.826), fruit volume (r = -0.827), aril weight / fruit (r = -0.885), 100 arils weight (r = -0.902) and aril per cent (r = -0.961). However, rind thickness exhibited positive and significant with specific gravity (r = 0.831**), fruit cracking per cent (r = 0.934**), rind per cent (r = 0.960**) and rind thickness (r = 0.847**).

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