

**ANNUAL TECHNICAL ABRIDGED REPORT
2016-17 CITRUS RESEARCH INSTITUTE,
SARGODHA**



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Citrus ranks first among all the fruit plants with respect to its area and production in Punjab Province. Citrus is grown in an area 192832 hectares with the production of almost 2395550 tons. (Source: Fruit & Vegetable condiments statistics of Pakistan 2014-15). As regard breakup of citrus varieties, kinnow mandarin is being cultivated as a dominant mono crop due to its popularity in local market & export potential.

Citrus Research Institute Sargodha is now focusing on raising and sale of seedless cultivars of citrus and bringing them under diversification in citrus sector. These varieties include seedless Kinnow, Salustiana, Taracco, Shamber & Tahiti lime. This Institute has successfully conducted different research trials on Cultural, Pathological, Entomological, Soil science & Post harvest aspects in the Govt. orchard. This institute has also worked on the control of citrus diseases like citrus canker, citrus scab, citrus melanose to improve the quality of fruit and to minimize the fruit losses of citrus growers. The contribution of this institute towards control of citrus fruit fly is also admirable because citrus fruit fly is future threat of this crop in export point of view. To overcome the problem of incompatibility issue for Musambi (a promising sweet orange variety) with Rough lemon root stock, this institute has started new experiments. Hopefully the production life span of this important commercial variety would be increased to overcome the problem of early decline syndrome in Musambi in the service of the citrus growers. For the purpose of diversification this institute has established a

block comprising on exotic varieties of citrus i.e. Daizy Mandarin, Kishu mandarin, Cavin mandarin, Harward Blood, Ryan Navel, Mc Mohn Valencia, Cara Cara Naval & Ornard Blood for the purpose of study and their recommendations for plantation in the farmer field.

This Institute has launched a campaign with the collaboration of Agri. Ext. Staff in the farm of trainings for capacity building of the farmers. This institute has also established overall four Screen Houses for producing disease free citrus nursery plants. The institute has also imported a Mechanical Citrus Tree Pruner for its demonstration in the Govt. orchard as well as in the field. This Institute is committed to work for the progress of citrus sector and prosperity of farming community by rendering valuable technical guidance and suitable citrus production technology.

HORTICULTURE DIVISION

1. Study for evaluation of different Root Stocks to assess their suitability on sweet orange cultivar Musambi.

To overcome the stoinic in compatibility of Musambi with Rough Lemon, the above said experiment was started. Musambi scion were budded on different root stocks viz Troyer strange, Benton, Cox mandarin hybrid, Carrizo strange. The scion of Musambi was also budded on Rough Lemon to compare its performance with the above mentioned root stocks. Statistical analysis of Initial results has shown that there is no incompatibility issue of Musambi with these root stocks. Musambi has attained maximum canopy volume (4.79 m³) with Rough Lemon while (2.45 m³) with Cox Mandarin Hybrid. The factor of in compatibility will be observed continuously with the passage of time.

2. Performance of different exotic varieties under Sargodha condition on local root stocks.

This experiment was started with the objective to evaluate the performance of various exotic varieties

on Rough Lemon Root stock under soil and climatic condition of Sargodha. The bud wood of these exotic varieties i.e. Daizy mandarin, Harward blood, Ryan Navel, Mc Mohn Valencia, Cara Cara Navel, Kishu, Arnold Blood & Caffin was brought from Australia in 2012 and budded on rough lemon. The budded plants were then planted in the field during 2015. Growth data taken during the month of April 2017 indicated that there is no issue of incompatibility with local root stock. Maximum plant height (170.8 cm) was attained by Harward Blood followed by Mc Mohn Valencia that attained the figure (163 cm) in this regard. Similarly maximum plant spread and height was attained by Ryan Naval with the figures (150.1cm) and (103 cm) for both of the parameters respectively. Canopy volume of Ryan Naval also remained maximum (1.84 m³).

3. To evaluate the performance of different strains of seedless kinnow (*Citrus reticulata*) under soil & climatic condition of Sargodha.

Above cited experiment was started with the objective to find out best strains of seedless kinnow under soil and climatic conditions of Sargodha. This experiment was consisted of eight different treatments. The bud wood source of these treatments was from three different locations i.e. Dr. Shujat Farm Bhalwal, Sultan Fruit Farm Vehari & Asad Tiwana Garden Sargodha. The grafted plants were transplanted in the field of Govt. orchard of this institute during the year 2015. Growth data taken during the year 2017 indicated that plants existing under T3 (strain-3 BW source Sultan Fruit Farm Vehari line-1 P- 19) have attained maximum height i.e. (1.47 m) followed by T1 strain (BW Source Doctor Shujat orchard R-9, P-2) with the figure (1.43m). Similarly maximum spread was also attained by T3 plants with comparatively attaining highest figure of (1.07 m³).

ENTOMOLOGY DIVISION:

4. Studies to test the color preferences of fruit flies as employed in the methyl eugenole traps.

The experiment started with the objective to find out the most preferred colour by the fruit flies to enhance catching efficacy of traps. Eleven treatments viz., Green, Yellow Green, Brown, Orange, Red, Blue, Black, Grey, White and Transparent with three replicates. Most attractive colour for the Pheromone Sex Traps for maximum catching efficiency was standardized i.e. yellow (78 fruit flies/trap/week) closely followed by transparent trap (73 fruit flies/trap/week) as compared to the brown colour (25 fruit flies/trap/week)

Two species of citrus fruit flies were identified during the experiment viz., *Bactrocera zonata* and *B. dorsalis* with former being the dominant one (89.93%). This research will open up new avenues for citrus growers to control fruit flies by using yellow and transparent colored traps in the orchard, which will help in timely monitoring and suppressing the fruit fly population upto significant level.

5. Efficacy of different insecticides against mealybug (*Drosicha mangiferae*) under laboratory condition.

This experiment was designed to investigate the efficacy of different insecticides (acetamiprid, imidacloprid, profenofos, methidathion, bifenthrin, carbosulfan, buprofezin, spirotetramat) in the laboratory of Entomology section CRI, Sargodha against adult stage of mealybug. The results showed that methidathion produced maximum mortality (41.86%) seven days after treatments closely followed by profenofos & carbosulfan (34.69% & 30.64%, respectively) seven days after treatments.

PLANT PATHOLOGY DIVISION :

6. Evaluation of different fungicide against citrus canker (*Xanthomonas axonopodius pv.citri*.)

The present study was initiated with the objective to evaluate the most effective fungicide against citrus canker. To overcome the citrus canker disease for better retention of fruit crop, the study involves 10 treatments, 4 replications with single plant/unit of treatment according to randomized complete block design and given with different treatments with their respective doses were as T1 Copperhydroxide @3gm / lit. of water, T2 Baccillus Spp. (Bio.Magic) @ 3 gm / lit. of water, T3 Streptomycin+Copperoxychloride @ 1 +3 gm / lit. of water, T4 Bordeaux Mixture@ 1 % ,T5 Validamycin @ 1 ml / lit. of water, T6 Kasugamycin+ Copperoxychloride @ 3 ml +3gm/ lit. of water ,T7 Copperoxychloride + Validamycin @ 3 gm +1ml/ lit. of water ,T8 Sulpher @2.5 gm/ lit. of water ,T9 Onion Extract @10 ml / lit. of water and T10 control with no application. Four sprays were done during the month of April, July and August. To observe the response of individual treatment the observations were subjected to statical analysis to establish the strength of the most efficacious fungicide or the combination of the fungicide. The statistically analysis indicated that the spray of T4 (Bordeaux mixture) decrease the disease up to 87% as compared to the control. The 2nd best result were seen with the spray of T1 (Cupper hydroxide) with the result of 75% decrease in disease over control.

7. Comparative studies on the efficacy of different chemicals to control citrus scab (*Elsinoe fawcettii*) and citrus melanose (*Diaporthe citri*) in kinnow.

The above said experiment was started with the objective to find out the most suitable fungicide against the citrus scab and citrus melanose disease in kinnow. On account of changing of weather patterns some fungal diseases in citrus growing areas are causing serious problems and economic losses to citrus growers. The prominent among them were citrus fungal scab and melanose. A part from that, citrus growers are receiving poor pay off

of their commodity. To overcome these issues a study was initiated during the last year comparing different fungicides to find out the most effective one to get rid of these diseases. Different fungicides were tested with their respective doses as T1 (Azoxystrobin)@ 1ml/liter of water, T2 (Pyraclostrobin + Metiram) @ 1.5 Gm / lit. of Water ,T3 ((Difenoconazole + Azoxystrobin) @1 Ml /lit. of Water, T4 (Copper Oxychloride)@ 3 gm / lit. of Water ,T5 (Copper Hydroxide) @ 2.5gm/ lit. of Water ,T6 (Tebuconazole + Trifloxystrobin) @ 0.5 gm /lit. of Water T7 (Fluoxystrobin)1 ml /lit. of Water ,T8 (Chlorothalonil+Thiophente methyl) @ 1 ml /lit. of water ,T9(Azoxystrobin+ Chlorothalonil) @1 ml/lit. of water and T10 with no application of fungicides. To observe the most suitable control measure among above mentioned chemicals treatments, the data was subjected to the statistical split and it was observed that spray of T3 (Difenoconazole + Azoxystrobin) proved most effective by decreasing disease up to 90% over control followed by the spray of T5 (Cupper hydroxide) which decreased disease up to 88% over control.

POSTHARVEST DIVISION:

8. Dietary fiber powders from orange pulp: characterization and application as a bakery product ingredient.

This research trial was started with the objective for the production and evaluation of dietary fiber powders form orange pulp of six orange varieties. Dried orange pulp fiber was utilized and organoleptically evaluated by incorporating into the biscuits as functional ingredient. The treatments/varieties involved in this trial were Succari, Salustiana, Hamlin, Valencia late, pine apple and Taracco. Methodology included recovery of Orange pulp (waste) collection after juicing and thereafter oven drying to produce orange fiber which was grinded into powder, sifted and incorporated as a functional ingredient into biscuit

recipe, during the year 2015-17. Nevertheless in recent study fiber from six varieties was compared, which remained at par in the parameters like Fat, Protein, Moisture, Ash, Crude fiber, pH, acidity, Swelling capacity, Water holding capacity and Oil holding capacity.

In the prepared biscuits various organoleptic parameters like that of color, taste, flavor, texture and overall acceptability were taken into account. The results of sensory evaluation revealed that biscuits with Succari orange fiber (6% fiber) performed best. This study has set basic guidelines for citrus processing industry to prepare fiber enriched functional baked goods at commercial scale. The results of the study are commercially worth exploitable.

SOIL AND PLANT NUTRITION DIVISION:

9. Studies on the foliar feeding of zn, cu and b on yield and quality of citrus cv. kinnow.

The experiment was initiated in 2015-16 with the objective to enhance yield and quality of kinnow mandarin besides improving tree health. The deficiency of micronutrients i.e. Zn, Cu, & B was observed during the analysis of soil. To overcome the problem the treatments i.e. T1: NPK (1000-500-500 g plant⁻¹) (control) T2: T1 + Zn foliar application @ 1000 ppm (0.3 % ZnSO₄), T3: T1 + B foliar application @ 60 ppm (0.05 % Borax), T4: T1 + Cu foliar application @ 500 ppm (0.2 % CuSO₄), T5: T1 + Zn+ B foliar application, T6: T1 + Zn+ Cu foliar application, T7: T1 + Cu+ B foliar application and T8: T1+ Zn + Cu + B foliar application were given to the experiment all units.

The statically analysis of the data indicated that T4 Cu (0.2% CuSo4) gave comparatively better results in terms of No. of fruit/tree (1208) & fruit yield (233.7kg/tree) respectively

10. Development of economical fertilizer programme to increase the qualitative yield of kinnow

The experiment was started in 2015-16 with the objective to make the nutritional program cost effective besides improving the yield and quality of kinnow mandarin. Treatments includes as T1: NPK (1000-500-500 g plant⁻¹), T2: 75 % N (urea) + 25 % N (FYM), T3: 50 % N (urea) + 50 % N (FYM), T4: 75 % N (FYM) + 25 N (urea), T5: 75 % N (urea) + 25 % N (poultry manure), T6: 50 % N (urea) + 50 % N (poultry manure), T7: 75 % N (poultry manure) + 25 N (urea), T8: 75 % N (urea) + 25 % N (compost), T9: 50 % N (urea) + 50 % N (compost), T10: 75 % N (compost) + 25 N (urea). All the treatment were applied according to the schedule of the experiment and all other cultural practices were also kept same. The statistical analysis showed that T6 = 50:50N (Uera + Poultry manure) gave good results with respect to no of fruits/tree (1036). Similarly T4 = 75:25N (FYM:Uera) exhibited good results i.e. (67.34mm) in terms of fruit size as compared to other treatments

Metrological data for the year 2016-17.

Months	Av. Max. Temp.	Av. min. Temp.	Highest Temp	Lowest Temp	Total rainfall
July-2016	35.3	26.4	42	22	228
August-2016	34.9	25.4	37	21	87
September-2016	33.9	24.8	38	21	14
October-2016	33.1	19.9	35	14	-
November-2016	25.9	11.5	30	8	2
December-2016	30.3	7.6	28	4	-
January-2017	17.4	6.2	21	1	21.9
February-2017	23.8	8.2	32	5	6
March-2017	27.1	13.3	36	7	15
April-2017	35.3	19.9	43	13	60
May-2017	38.5	24.6	47	20	20
June-2017	37.9	25.8	47.20	20	32

Meteorological data recorded for the financial year 2016-17 indicated that maximum rainfall (228 mm) was recorded in July 2016 followed by 87 mm in August 2016 similarly average maximum temperature (38.50c) was recorded in May, 2017. Average Highest temperature (47.0c) was recorded both in May, & June, 2017. The prevalent weather condition particularly high temperature in May & June, 2017 caused fruit drop in citrus. Similarly hot & humid

condition during the month of July & August, 2016 facilitated fungal diseases to spread in citrus. r.

OTHER ACTIVITIES

- Characterization & DUS Test of five advance lines of citrus was completed.
- Construction of two new Screen Houses for production of disease free nursery plants.
- Import of Mechanical citrus Pruner for its introduction in Citrus Sector to facilitate the process of pruning.
- Establishment of four multiplication blocks of seedless kinnow for supplying bud wood to the Registered Nurseries.
- Catching efficiency of different colour sex pheromone traps against male fruit fly was standardized
- Advisory services were rendered to the intended citrus growers.
- Up-gradation & Land Sacaping of the campus was started for beautification of the office premises.
- Soil & water samples analyzed = 558
- Disease sample analyzed = 241
- Radio Talks delivered = 11
- TV Talks delivered = 01
- Popular Urdu Articles = 05
- Research Paper published = 03
- Training delivered = 14
- No of Mega events = 01
- No of Seminar = 02
- No of workshop = 01

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