SUMMARY

V SUMMARY AND CONCLUSION

This study was crried out on apricot and guava fruits of Amaar and Balady cultivars, respectively during two successive seasons of 1988 and 1989. Forty five trees from each cultivar grown in two orchards located at two regions within Kalubia governorate, namely El-Seiafa-Toukh and Nawa-Shebein El-Kanater were devoted for apricot and guava, respectively, with a main purpose for studying the following:

V.1.- Apricot:

V.1.1- Determination of maturity indices:

The periodical changes in both fruit physical and chemical characteristics were studied through the last stage of fruit development, since fresh weight, dimensions, shape index, flesh firmmess, rind colour, TSS%, acidity%, TSS/acid ratio and sugars content of fruit were included in this respect.

V.1.2- Effect of transporting containers on mechanical damage of apricot fruits:

Palm crate with cardboard liner (15 kg.), plastic box (15 kg.), plastic box (10 kg.), and carton box of (4 kg.)were examined

V.1.3- Effect of some prestorage treatments on fruit keeping quality:

Soaking for 2-3 minutes either in warm water (45^{o}C) or in solution of borax + boric acid mixture at concentration of 4,2% respectively, beside washing with tap water as control were investigated under three different condition of storage viz ambient "room codition of 27^{o}C $\pm$ 2 and 55-65% RH" and cold storage either at 5^{o}C or 0^{o}C, with 80-90% RH. Fresh weight loss%, decay% (discarded fruits%), flesh fruit firmnss, TSS%, acidity%, TSS/acid ratio and sugar content of apricot fruits were periodically determined in relation to the above mentioned storage treatments.

V.2- Guava:

V.2.1- Effect of kind of transporting containers on fruit damages of guava:

Four types of containers were included i.e., palm crate with liner (15 kg.), plastic box (25 kg.) plastic box (20 kg.) and carton box of about 5 kg capacity.

V.2.2- Effect of pre-storage treatments on keeping quality of guava:

Four pre-storage treatments, namely: 1- Washing with water (control), 2-soaking in warm water (45°C), 3-soaking in solution of borax + boric acid mixture at 4,2% concentration, respectively and 4-oil paraffination were investigated. Since, periodical changes of the above mentioned characteristics previously studied with apricot fruits were also concerned for Balady guava under three conditions of storage i.e., room temperature "22°C ± 2 and RH 50-60%", cold storage either at 15°C or 10°C with RH of 80-90% during both 1988 and 1989 seasons.

The obtained results of the present investigation could be summarized as follows:

V.1. Apricot:

V.1.1- Changes in physochemical properties leading to maturity of developing Amaar apricot fruits:

V.1.1.a- Fruit fresh weight:

Fresh weight of Amaar apricot fruit was gradually increased at an equal intermediate rate from April 23th or 18th till May 13th and 3rd during 1988 and 1989 seasons, respectively, where the rate was suddenly increased to show its maximum level. Thereafter the increase was acutely reduced, then nearly ceased on May 18th and 8th when the average weight reached 16.7 and 15.6gm during both 1988 and 1989 seasons, respectively.

V.1.1.b- fruit dimensions:

Obtained data revealed clearly that the previously mentioned trend of the fruit fresh weight was similar to that detected with both fruit dimensions i.e., fruit length and diameter, however the rate of fruit diameter showed a slight increase over that of length.

V.1.1.c- fruit shape index:

However no statistical differences were induced regarding fruit shape index (fruit length: fruit diameter), but a very little reduce in its value was

observed which is the main responsible for the tendency of Amaar apricot fruit to take the relative rounded shape instead of the oblonged one that reflects the relative higher rate of diameter increment then fruit length.

V.1.1.d- fruit flesh firmness:

Obtained results declared that fruit firmness of Amaar apricot cv. was continuously decreased with the age progression, however the rate of fruit softness resulted during the first measuring dates was obviously greater, then reduced acutely on May 3rd and April 28th for both 1st and 2nd seasons, respectively till the last measuring date where the decrease in fruit firmness was significantly neglected.

V.1.1.e- Rind colour:

Data obtained showed that the rind ground colour was gradually changed from deep green "S.G 5/8 strong green" to a variable degrees of the yellowish green colour from one season to another. Thus, it could not be recommended to depend on the fruit skin colour only for determining the suitable picking stage.

V.1.1.f- fruit juice total soluble solids%:

Data obtianed disclosed clearly the occurrence of a significant gradual increase in fruit juice TSS% by aging, however the rate was sharply increased during the second third of measuring dates.

V.1.1.g- fruit juice total acidity:

The present results showed that fruit juice total acidity% was gradually decreased with the advancement of fruit age. Such decrease took place at steady moderate rate through the whole period of the last developing phase, which reflects a relative lower variance and consequently changes in fruit juice acidity of Amaar apricot fruits is not enough to be used alone as an maturity index.

V.1.1.h- fruit juice TSS/Acid ratio:

Data obtained during both seasons, revealed clearly that TSS/acid ratio in fruit juice of Amaar apricot cv. Was continuously increased by fruit aging till it reached 4.5-4.7 at maturity.

Generally it could be recommended that Amaar apricot fruit could be safely picked at Toukh "Kalubia

governorate" depending upon the following characteristics as maturity indices:

1- Fruit fresh weight of about 16.0 gm.

2- Fruit dimensions of 3.0 and 3.3 cm. for diameter and length, respectively.

3- Flesh firmness of about 9-10 lb/inch^2

4- TSS% of about 10

5- TSS/acid ratio of about 4.5

V.1.2- Effect of transporting containers on mechanical damage of Amaar apricot fruits:

Data obtained regarding mechanical damage in Amaar apricot fruit as influenced by type of transporting containers "padded bottom palm crate with perforated carton liner 15 kg cap., plastic boxes of 15 and 10 kg.cap. and carton box of 4 kg.cap." showed clearly that four forms of damages namely bruises, abrasions, punches and scratches were occurred at destination. However, palm crate with carton liner "15 kg.cap." resulted in the highest value of the total damaged fruits percentage followed by plastic boxes of 15 and 10 kg. capacity, as well as carton box of 4 kg.cap. showed the lowest percentage. On the other hand bruises represented the main form of mechanical damage, but the

reverse was true for punches., Meanwhile, damaged fruits% due to the incidence of either abrasions or scratches were in between, however occurrence of the former from was more pronounced.

Generally it could be concluded that both plastic boxes of 10 kg. and carton boxes of 4 kg.cap. were the most suitable types of transporting containers for apricot fruits, especially the second one.

V.1.3- Effect of some prestorage treatments on keeping quality of stored Amaar apricot fruits:

In this regard Amaar apricot fruits were stored under three different condiions "room temperature, refrigerated storage at 5°C and 0°C with 80-90% RH" after they had received th following prestorage treatments: 1- Washing with tap water "control", 2- soaking for 2-3 minutes either in hot water "45°C" or solution of borax + boric acid mixture at 4,2% concentrations, respectively.

Data obtained concerning the periodical response of some fruit physical and chemical properties to the different treatments during the whole duration of storage could be summariezed as follows:

V.1.3.1- Periodical loss% in fresh weight:

From the obtained results, it could be noticed that Amaar apricot fruits showed obviously a continuous reduction in their fresh weight during storage regardless of storage conditions or prestorage treatments. However the rate of reduction per an interval was more greater in these fruits remained under room condition than those kept up under cold storage. In addition, soaking Amaar apricot fruits either in hot water "45°C" or in solution of borax + boric acid mixture showed a beneficial effect on reducing the rate of fresh weight loss % in cold stored fruits, however, such trend was more pronounced at 0°C Meanwhile, this trend was true with hot water only for fruits under room condition, but with soaking in solution of borax + boric acid mixture the reverse was true.

V.1.3.2- Percentage of periodical decayed fruits:

Data obtained showed that the incidence of decay in Amaar apricot fruits stored under room condition had been taken place too earlier "2 days from starting storage". However, not only no sign of decay could be observed during the first two sorting dates of cold

stored fruits but also 15 days in most cases are needed to pass before the occurrence of decay. Moreover, the rate of discarding "both decayed and shrivelled fruits" was continuously increased as the storage period was prolonged, where the last sorting date pointed out the maximum value of discarded%, regardless of storage condition or prestorage treatment. On the other hand, the average rate of discarded fruits under cold storage per an interval was greatly reduced to represent only about 10% of that detected under ambient condition. In addition, prestorage soaking either in hot water 45°C or in borax + boric acid mixture 4,2%, generally reduced the discarding% of Amaar apricot fruit, especially those stored under 5°C and 80-90% RH where differences were significant as compared to control.

V.1.3.3- Periodical changes in fruit firmness:

Data obtained revealed that flesh firmness of Amaar apricot fruits were gradually decreased as duration of storage was extended. However, the rate of softness was more greater under ambient storage than cold storage. On the other hand rate of decrease in flesh fruit firmness was sharply increased during the last third of storage duration, either at room or cold

storage. In addition, however no specific trend could be detected as the effect of prestorage treatments was concerned, but to some extent it could be concluded that control and soaking in borax + boric acid mixture were of a compareable influence from one side and resulted in a relative firmner fruits than hot water treatment from the other side as an average of 2 seasons was regarded.

V.1.3.4- Periodical changes in TSS%:

Fruit juice TSS% of Amaar apricot cv. was gradually increased by the advancement of storage period. However, such increase was significant, regardless of prestorage treatment and condition of storage, but soaking fruits in hot water "45°C" exceeded statistically two other treatments during both seasons as an average of values determined throughout the whole period of storage was concerned.

V.1.3.5- Changes in fruit juice total acidity:

Periodical determination of total acidity% of Amaar apricot fruits during storage revealed the incidence of a gradual decrease with storage extention. Soaking fruits in hot water "45°C" showed generally the

lowest value of fruit juice total acidity, however such trend was more pronounced with cold stored fruits at 5°C where the differences were significant as compared either to those of control or borax + boric acid soaking treatments during both seasons of study.

V.1.3.6- Changes in fruit juice TSS/acid ratio:

It could be noticed clearly that a steady gradual increase in the TSS/acid ratio of apricot fruits was occurred with the advancement of duration of storage. On the other hand, prestorage treated fruits by soaking in hot water showed always the highest value of fruit juice TSS/acid ratio.

V.1.3.7- Changes in fruit juice total sugars percentage:

It could be noticed clearly that fruit juice total sugars% continuously increased as the storage time was advnaced for fruits stored either under room condition or refrigerated storage 0°C/5°C. However, such increase was more pronounced in hot water soaked fruits, expecially when storage was carried out under ambient condition. On the contrary, fruit juice total sugars%

of Amaar apricot fruits at the last determining date tended to decrease and took other way around.

V.2- Guava:

V.2.1- Effect of transporting containers on mechanical damage of Balady guava fruits:

Data obtained pointed out the superiority of ca rton boxes of 5 kg. capacity in reducing the percentage of total damaged fruits than other types of transporting containers, followed by plastic boxes of 20 kg capacity, plastic boxes of 25 kg cap. and palm crate with carton liner which ranked last, in this regard. Moreover, three forms of mechanical damages were observed, where bruises was the major one, while abrasions and punches were equally exhibited and both together represented less than 10% of the total damaged fruits, regardless of type of transporting containers. Meanwhile, no scratches had been occurred at destination.

V.2.2- Effect of some postharvest treatments on storage ability of Balady guava fruits:

Four post-harvest treatments namely: 1- Washing in tap water "control", 2- soaking in hot water "45°C", 3-

soaking in solution of borax + boric acid mixture "4,2%" and 4- paraffination had been applied before storing guava fruits under room condition "temp of 22°C + 2 and 50-60% RH" and refrigerated storage "temp at 15°C/10°C with 80-90% RH". Data obtained concerning periodical changes in both fruit physical and chemical properties in relation to the different prestorage treatments throughout storage under its three different conditions could be summarized as follows:

V.2.2.1- Periodical loss% in fresh weight:

Stored fruits of Balady guava showed a continuous loss in their fresh weight with the advancement of storage period, however loss rate was relatively higher in fruits kept up under ambient temperature than those of refrigerated storage. On the other hand surface coated fruits with paraffinic oil showed significantly the lowest value of loss%, while two other treatments i.e., soaking either in hot water or borax + boric acid mixture slightly reduced the loss rate than control.

V.2.2.2- Decay percentage:

Data obtained pointed out that condition of storage had a striking effect on decay% in Balady guava

fruits during storage, where no sign of decay could be observed before 2 or 3 weeks from starting storage for the prestorage treated fruits by soaking/surface coating treatments" as kept up at 15°C and 10°C, respectively. However, under room condition one week only was needed to pass for the incidence of decay in most cases. Moreover, paraffination treatment was the superior where it showed not only the lowest percentage of discarded fruits, but also it delayed statistically the occurrence of decay than other treatments. Moreover, soaking in borax + boric acid mixture was also effective, especially under cold storage.

V.2.2.3- Fruit firmness:

The present result showed that fruit flesh firmness of Balady guava fruits was continuously decreased with extention of storage time. However, fruit softening took place sharply under room condition, but at refrigerated storage it was gentely continued, especially with 10°C stored fruits. On the other hand the response to the prestorage treatments was significant, where the paraffinic oil surface coated fruits showed statistically a great retardation of the quick decline in their flesh firmnes than those

of other treatments since the hardest flesh at any sorting date was always concomitant to such fruits. Moreover, soaking either in hot water or solution of borax + boric acid mixture helped in remaining fruits more firmer than control, especially for cold stored fruits of Balady guava cv.

V.2.2.4- Fruit juice TSS%:

Data obtained declared that fruit juice TSS% increased continuously as duration of storage was extended until the last date where the increase was ceased or the response took other way around. However, the rate of increase was relatively higher in that fruits held under room condition. Meanwhile, paraffination treatment resulted statistically in the lowest rate of increase as compared to control or two other treatments. The reverse was true with hot water "45°C" treatments but the increase was not significant as compared to control.

V.2.2.5- Fruit juice total acidity%:

The present result showed that fruit juice total acidity percentage of Balady guava fruits was significantly decreased with the advancement of storage

time. The rate of decrease was more pronounced in fruits stored under room condition than those under refrigerated storage. On the other hand, all the prestorage treatments were appreciably of the same effect from one side and did not statistically differ than control from other in this respect.

V.2.2.6- Fruit juice TSS/acid ratio:

The value of fruit juice TSS/acid ratio was continuously increased by the advancement of storage duration, regardless of both condition of storage and prestorage treatments applied. However, the rate of increase was obviously reduced under cold storage 15°C/10°C. However, the ratio was responded to the prestorage treatments, but it was less pronounced than that detected to extending storage time. In addition, the lowest value of TSS/acid ratio was always concomitant to the surface coated guava fruits with paraffinic oil followed by (B+B) , but the reverse was true with fruits of both hot water and control treatments.

V.2.2.7- Fruit juice total sugars percentage:

As for the periodical changes in fruit juice total sugars% in guava fruits through duration of storage, it could be noticed that a gradual increase was obviously detected by prolonging time, except at the last date, where the increase was not only ceased but also the trend took other way around in most cases. Such trend was true regardless of condition of storage or prestorage treatments, however the rate of increase under refrigerated storage was lesser than that of ambient stored fruits. On the other hand surface coated fruits with paraffinic oil showed generally lower sugars% than those other treatments especially in cold stored fruits where the differences were significant. The reverse was true with hot water soaked fruits however differences were insignificant in most cases, as well as soaked fruits in borax + boric acid solution and those of control were in between.

Anon (1966): Control of brown rot in peaches by pasteurization. Orchard. N.Z., 39(1): 8. C.F. Rev. Appl. Mgeol., 1966, Page. 336.

A.O.A.C. (1970): Association of Official and Agricultural Chemist 11th edition. Washington, D.C. USA.

Apessos, J. (1962): A study on the differentiation of flower primordia in relation to the development of the vegetative shoots and of the fruit on some varieties of prunus amygdalus and prunus persica. These Unv. Bardeaux, 1962, pp. 167, bibl. 49, illus. (Hort. Abst. 1963, No. 3549).

Baccaunaud, M. (1989): Plastic films, Their importance in maintaining the quality of fruit during distribution. Infos, centre-technique-inter-professionnel-des-fruits-et. Lequmes, France. No. 50, 31-36; 8 ref., 2 pl.

----------; Moras, P. and Audubert, A. (1987): Conditions of maintaining quality during distribution. Infos, centre- Tech- nique- interprofessionnel- des- fruits-et-Legumes, France. No. 29, 53-56; 4 ref.

Baker, G.A. and Davis, L.D. (1951): Growth of the cheek diameter of peach. Proc. Amer. Soc. Hort. Sci., 27: 104-10.

Barakat, M.R.S. (1969): Physiological studies on the determination of maturity of some peach varieties. M.Sc degree, Fac. of Agric. Cairo University.

Bedford, C.L. and Robertson, W.F. (1955): Harvesting and ripening freestone peaches for processing. A Hort. Bull, Mich. Agric. Exp. Stat. 37: 489-91 (Hort. Abst. 1956, No. 3589).

Bedford, C.L. and Robertson, W.F. (1955): Harvest maturity and ripening of peaches in relation to quality of the canned and frozen product. Tech. Bull. Mich. Agric. Exp. Stat. 245, pp. 31 bibl. 7. (Hort. Abst. 1956, No. 1451).

Bhargava, S.N. and Singh, A.P. (1974): Thiabendazole-storage of guava fruit. Univ. Allahabad. India Indian Phytopathology Publ. 27(4): 613-615.

British Colour Council (1938): Horticultural colour chart. Issued in Colliaboration with the Royal Hort. Sci.

Brooks, C. and McColloch, L.P. (1936): Some storage diseases of grapefruit. J. Agric. Res., 52(5), March, Washington, D.C.

Brown, B.I. (1983): Postharvest studies on guava. Sandy Trout food preservation Research Laboratory. Austral. Horticultural Research Newsletter No. 55: 152-153.

Chandler, W.G. (1957): Deciduous orchards. London Hentry Kimpton pp.492. Third Edition.

Chen, P.M.; Richardson, D.G. and Mellethin, W.M. (1982): Differences in biochemical composition between' Burre d'Angou and Bosc pears during fruit development and storage. Jour. of Amer. Soc. of Hort. Sci. 107(5): 807-8.

Chen, P.M.; Mellethin, W.M. and Borgic, D.M. (1983): Changes in ripening behavior of cultivar d'Anjou pears pyrus communis after cold storage. Mid-Columbia Experiment stastion, Oregon state Univ., Hood River, Oreg. 97031. Sci. HORTIC (AMST) 21(2), 1983, 137-146.

Chiang, M.N. and others, (1963): The effect of post-harvest treatments on decay in loose. Skinned organes Spec. Publ. Nat. Taiwan Univ. 11, pp. 22. (c.f. Hort., Abstr., 35:(No) 6555, 1965).

Chundawat, B.S.; Singh, J.P.; Kafnsa, R.L. and Gupta, O.P. (1976): Post-harvest studies on guava fruits: 1- Effect of packing and storage period on the quality of fruits. Haryana Agricultural University, Hissar, India. Haryana Journal of Horticultural Sciences. 5(3/4): 130-136 (15 ref.).

Coates, W.W.; Mitchell, F.G.; Mayer, G. and Maxie, E.C. (1974): Cold storage effects on fresh market peaches, nectarines and plums. II- Using low temperatures to delay internal breakdown. California Agriculture. 28(10), 13-14 [En] California University Davis, U.S.A.; (Hort. Abst. Jour. Vol. (45) No. 11; 8178.

Daines, R.H. (1970): Effect of fungicides dip treatment and temperature on post-harvest decay of peaches. Plant Dis. Reptr., 54(9): 764-676.

Deshpande, P.B. and Salunkhe, D.K. (1964): Effect of storage on certain biochemical changes in apricots and peaches. Food technology, 18: 1195-8.

Dorsey, M.C. and McMunn, R.L. (1927): Relation of time of thinning peaches to the growth of fruits and trees. Proc. Amer. Soc. Hort. Sci. 24: 221-228.

Eckert, J.W. and Sommer, N.F. (1967): Control of diseases of fruits and vegetables by post-harvest treatment. Annual review of phytopath., 5: 391-432.

El-Barkouki, M. (1958): Physiological studies on Ripening, handling and storage of Egyptian mandarines. Ph.D. Thesis, Cairo University.

El-Waziry, K.M. (1968): Studies on the storage treatments of Amoun orange fruits. M.Sc. Thesis, Cairo University.

Farooqi, W.A.; Ahmad, M. and Khalid, Z.M. (1979): Postharvest research on citrus fruits at NIAB. Proceeding of the Florida State Horticultural Society. 91, 122-124. (Hort. Abst. 50: 4708).

Fideghelli, C.; Cappellini, P. and Monastra, F. (1967): Experiments on the forced ripenning of fruits. Progr. Agric., Bologna, 13: 405-16 (Hort. Abst. Vol 1958, No.).

Foad, A.A. (1984): Physiological studies on picking, packing and storage treatments of Bircker apple fruits. M.Sc Thesis, Cairo University.

Garg, R.C.; Ram, H.B. and Singh, S.K. (1976): A note on the effect of post-harvest treatment with indole butyric acid and wax-emulsion on the storage behaviour of guava (Psidum guajava L.). Government fruit preservation and canning. Institute, Lucknow. India. Progressive Horti-culture, 8(2): 85-88 (9 ref.).

Gerdts, M. and LaRue, J.H. (1976): Growing shipping peaches and nectarines in California. Division of Agric. Sci., Univ. of California, Leaflet 2851.

Ginsburg, L. (1958): Factors that influence the keeping quality of South African peaches on different markets. Dec. Fruit Gr., 8: 279-84 bibl. 3. illus. (Hort. Abst., 1959, No. 1161).

Goldenberg, N.; Hammond, S. and Firth, L. (1979): The bulk shipment of apples inhibition of superficial scald by oil-impregnated paper. Journal of the Science of Food and Agriculture 30(4): 377-380. (Hort. Abst. 49: 7350).

Goosen, M.C. (1961): The effect of picking stage on the quality of peaches. Dec. Fruit Gr. 11: 9-11 illus. (Hort. Abst. 1961, No. 4009).

Gunderson, M.F. (1961): Model problem in frozen foods. In. Proc. Low temperature. Microbiology symp., 299-312 (Campbell Soup Co., Camden, New Jersey, PP. 322).

Gupta, O.P.; Singh, B.P. and Gupta, A.K. (1979): Studies on the shelf life of different guava cultivars. Haryana Agriculturs University, Hissar. Indian. Haryana Agricultural University Journal of Research, 9(9): 247-250 (10 ref.).

Guzewska, I.; Lange, E. and Machnik, J. (1968): Storage of 8 apple cvs. in conventional and cold storage. Prace Instytutu sadownictwa W Skiermiewicach, 12: 407-24. (Hort. Abst. 42:(No)400).

Harding, P.R. Jr. and Savage, D.C. (1964): Investigation of possible correlation of hot water washing with excessive storage decay in coastal Califorina lemon. Packing House, PLL, Dis. Reptr., 48: 808.

Hussein, F. (1966): Physiological studies on pears during fruit development and storage. Arch. Gartenb., 14: 129-82. (bibl. 194, Illus., English and Russian Summaries) (Hort. Abst. 1967, No. 426).

Kabeel, M.T. (1959): Physiological studies on picking, handling, packing, storage and artificial ripenning of Pearl Harbour tomatoes. Ph.D. Thesis, Cairo University

Kabeel, N.T. (1987): Effect of post-harvest treatments on the shelf life of some stone fruits. M.Sc. Thesis, Zagazig University.

Kartar Singh and Chauhan, K.S. (1983): Effect of post-harvest application of Waxol-o-12. and $KMnO_4$ on guava fruits. Haryana Agricultural University, Hissar, India. Punjab Horticultural Journal. 23(1/2): 38-42 (8 ref.).

Kilany, A.S. (1982): Effect of some growth regulators and horticultural practices on the growth, productivity and keeping quality of "Le Conte" pear. Ph.D. Thesis, Fac. Agric. Cairo University.

Kott, V. (1951): The dynamics of the L, ascorbic acid content of furits during development. Sborn. Csl. Akod. Zemed-Ved.Ser. A, 26: 427-46, bibl. 24, illus. (Hort. Abst. 1954, No. 1214).

Kovale, A. (1967): Measurements of ground colour of apples by means of reflected light. Acta Agric. Scands 17: 108-14 bibl. 22. (Hort. Abst., 1968, No. 422).

Lilleland, O. (1932): Growth study of the peach fruit. Proc. Amer. Soc. Hort. Sci., 29: 1-12.

Long, J.K. (1951): Citrus wastage. progress report on investigation on moulds and rots in oranges at Goaford laboratory. Citrus New, 27: 6, January, 1951.

Matsumoto, T.T. and Sommer, N.F. (1967): Sensitivity of Rhizopus stolonifer to chilling. Phytopathology, 57: 881-884.

McCellan, W.D. (1942): Temperature as it affects spore germination in the presence of copper sulfer. Phytopath., 32: 394-398.

Millim, K.; Gherghi, A.; Margineanu, L. and Panait, E. (1975): Studies on the cold storage of pear. Lucrari Stiintifice, Institutul de cercetari pentru Valor ificarea Legumelor si fructelor. 6: 183-194 (Plant Breeding Abstracts 1973).

Millim, K.; Gherghi, A. and Panait, E. (1982): Qualitative changes in pears during cold storage. Institutul de cercetari si Proiectari Pentru Valorificarea si Industriazarea Legumelor is Frutelor, Bucharest Romaina. Romania. 13: 121-127. (Hort. Abst. 43 (4) 2782).

Mitchell, F.G.; Mayer, G.; Maxie, E.C. and Coates, W.W. (1973): Internal breakdown of nectarine, peach and plum. Final Report to California Tree Fruit Agreement. Pomology Dept., Univ. of California at Davis.

Mitchell, F.G.; Mayer, G. and Beede, R.H. (1977a): Studies of various factors affecting post-harvest performance of shipping stone fruits. Summery Report to California tree fruit agreement, nectarine administrative committee, peach commidity committee and plum commodity committee. Univ. of California at Davis.

Mitchell, F.G.; Mayer, G.; Maxil, E.C. and Coates, W.W. (1977b): Cold storage effects on fresh market peaches, nectarines and plums. II- Using low temperature to delay internal breakdown. California 28(10): 13-14 (En.) California University, Davis USA. (Hort. Abst. Vol, 49, No. 11 (8178).)

Molnar, L. and Turt, I. (1975): The relation between apricot fruit size at pit hardening and maturity. A kjszimeretenck Osszefuggese a esonthejszilar-dulaskori nagysagaval, Gyumolestermesztes, 2, 3-13 (Hu, en, ru, 6 ref.) KKI Kiserleti Telep, Keeskemet-Szark as Hungary. (Hort. Abs. 1977, Vol. 7, No. (1), 198).

Monzini, A. and Gorini, F. (1979): Prospects of a new cold storage system for winter fruit. Frutticoltura, 41(2): 5-9. (Hort. Abst. 43(No) 2782).

Mukerjee, P.K.; Srivastava, R.B. and Dayal, K. (1980): Cold storage of pears grown in plains. Hort. Exp. & Training Centre, Saharanpur, Uttar Pradesh, India. Progressive Horticulture, 12(1): 77-80.

Mustard, M.J. (1953): Packing and storage of persian limes. Proc. Fla. St. Hort. Soc. for 1950, P. 288-362.

Patron, A.; Swinzow, H. and Michel, F. (1956): Maturation study of the apricot (Var. Conino) in Marocco with regard to canning. Fruit exp., 26-166-77 bibl. 13. (Hort. Abst., 1957, No. 2177)

Peterson, E.L. (1957): Borax-Boric acid use cleared by Food and Drug. The California Citrograph 43(2): 45.

Phillips, D.J. and Austin, R.K. (1982): Changes in peaches after hot-water treatment. Plant Dis., 66(6): 487-488.

Pierson, C.F. (1966): Fungicides for the control of blue-mold rot of apples. Plant Dis. Reptr., 50: 913-915.

Prasad, A. and Shukla, J.P. (1979): Studies on the ripenning and storage behaviour of guava fruits (Psidium guajava L.). C.S. Azad University of Agriculture and Technology, Karpur, India. Indian Journal of Agricultural Research. 13(1): 39-42 (11 ref.).

Proebsting, E.L. Jr. (1962): Factors influencing the relationship of harvest diameter to reference date diameter of Elberto peaches. Proc. Amer. Soc. Hort. Sci., 80: 154-62.

Pruss, A.G. and Sopalova, E.V. (1972): Pear storage. Trudy Po Priklandnoi Botanike, Genetike i Selektsii, 46(2): 111-14. (Hort. Abst. 43:(No) 8283).

Randhawa, G.S.; Yadaw, I.S. and Nath, N. (1963): Studies on flowering, pollination and fruit development in peach grown under sub-tropical conditions. Indian J. Agric. Sci., 33: 129-38.

Rees, D.I. (1958): The chemical constituents of Victoria plums. Changes during growth on the tree. J. Sci. Food Agric., 9: 404-10.

Roberto, I.; Vazquez-Ochoa and Maria, T. Colinas-Leon, (1990): Changes in guavas of three maturity stages in response to temperature and relative humidity. Departmento de Fitotecnid, Universidad Autonoma Chapingo, Hort. Science, Vol. 25(1).

Shicherbatko, D.M.; Illarionova, N.P. and Sharova, N.I. (1986): Variation in the chemical composition of Sbornik Nauchnykh Trudov po priklandnoi Botanike Genetikei selekt 104: 83-87. (Hort. Abst. 59(9)166).

Simeone, A.M. and Corazza, I. (1986): Susceptibility of some stone fruit cultivars to brown rot. Annali-dell. Instituto-sperimentale-per-la-futticoltura, Italy. 27, 55-60, 7 ref.

Sims, E.T. Jr. and Comin, D. (1963): Evaluation of objective maturity indices for Halehaven peaches. Proc. Amer. Soc. Hort. Sci. 82: 125-30.

Smith, W.L. Jr. (1962): Reduction of postharvest brown rot and Rhizopus decay of eastern peaches with hot water. Plant dis. Reptn, 46: 861-865.

Smith, W.L. Jr. and Bassett, R.D. (1964): Reduction of postharvest decay of peaches and nectarines with heat treatment. U.S. Dept. Agr. marketing Res., 643.

Smith, W.L. Jr. and Penny, R.W. (1972): Control of postharvest brown rot of sweet cherries and peaches with chemical and heat treatment. U.S. Dept Agr. Marketing Res. Reptr., 979.

Smith, W.L. Jr. and Redit, W.H. (1962): Reduction of peach decay by hydrocooling with chemical solution and chemically treated ice. Plant. Diz. Reptr., 46: 211-226.

Smith, W.L. Jr.; Parsons, C.S.; Anderson, R.E. and Bassett, R.D. (1964): Reduction of postharvest decay of peaches and nectarines with heat treatments. U.S.D.A. Mktg. Res. Rept. 643, p. 22.

Snedecor, G.W. and Cochran, W.C. (1972): Statistical Methdos 6th ed. Iowa State Univ. Press, Ames., Iowa, USA, pp. 593.

Sommer and Mitchell, F.G. (1968): Heat treatment for brown rot control in peaches and nectarines. THe blue Anchor, 45: 9-14.

Sommer, N.F. (1982): Postharvest handling practices and postharvest diseases of fruits. Plant Dis., 66: 357-363.

Spruit, G. (1981): Results of a storage trial with Conference 1980/81. Sprenger Institut. Wageningen, NetherLands. Fruitteelt. 11(34): 1050-105) (Hort. Abst. 50:(#)1817).

Srivasiava, H.C. (1962): Storage behaviour of skin coated guava (Psidum gujava) under modified atmosphere. Food, Sci., Mysore, 11: 244-8, bibl. 9.(Hort. Abst. 33(3): (6216).

Sterling, C. and Klab, A.J. (1959): Pectic changes in peach during ripening. Bot. Gaz., 121: 111-13, bibl. 27. (Hort. Abst. 1960, No. 4941).

Stoll, K. (1976): Storage of the pear cultivar Louise Bonne. schveizerischs zeitschrift fur obst and weintau. 112(14): 304-309 (Hort. Abst-43:No 1729).

StrickLand, A.G. (1954): South Aus. Department Report on trials and investigation in progress on citrus fruits. Citrus New, 29: 122, (September, 1954).

Subhashchandra, D.; Rao, M.R. and Venkateswara, S.R. (1985): Studies on post-harvest changes and shelf-life of guava Allahabad safeda. Agricultural Coll., Tirupati (India). Dept. of Horticulture. Andhra Agricultural Journal, V. 32(4), P. 291-294.

Surramanin, T.M.; Sadasivam, R. and Raman, N.Y. (1973): Screening of some fungicides for the control of storage decay in mandarin orange (Citrus reticulata Blanco). Indian Journal of Agricultural Sciences 43(3): 284-287 (En, 2 Tab.). Tamil Nadu Agric., Coimbatore. (C.F. Rev. Plant Pathol., 1974, Page 614, (3025).

Taylor, O.C. and Mitchell, A.E. (1953): Relation of time of harvest to size, firmness and chemical composition of fruits of sour cherry (Prumus cerasus). Proc. Amer. Soc. Hort. Sci., 62; 267-71.

Teixeira, A.R.; Torres, M.A.; Carmona, M.A.; Barreiro, M.G.; Silva, M.J. and Cabral, M.L. (1973): Cold storage with special reference to the pear cultivar Racha. Lisbon, Portugal; Junta Naciomal das Frutas. 63-68 (Hort. Abst. 43:No 2751).

Tewari, J.D. (1965): Chemical changes in the flesh of Pyrus pashia fruits during growth. Punjab hort. J., 5: 24-8, bibl. 13. (Hort. Abst. 1966, No. 4209).

Tomas, P. and Dalal, V.B. (1968): A note on the effect of some chemical on control of stem-end rot in Mangoes after harvest., Sci. Cult., 34(7) (I table, C. Food Technol. Res. Inst., Mysore.) C.F. Rev. Appl. MgCol.., 1969 Page 358, (1870).

Tukely L.D. (1963): A comparison in fruits sizing among early and late peach varieties. Fruit var. Hort. Dig., 13: 11-13 bibl. 2 (Hort. Abst. 1964, No. 2303).

Upshall, W.H. (1964): Fruit maturity and qualtiy. Bull. Ontario Dep. Agric. 447, 1946, pp. 15. (Hort. Abst. 1947, No. 62).

Varady, B. U.; Hamori, S.J. and Faskerti, E. (1983): Determination of maturity in apricots by instrumental measurment of flesh frimness and colour. Acta. Alimentaria, 12: 4, 412-413.

Visagie, T.R. (1985): Optimum picking maturity for apricots preliminary results and recommendations. Deciduous fruit grower, 35(11) 401-404 (En, Al) fruit and fruit Technology Research institute, Stelienbosch, South Africa. (Hort. Abst.1989, Vol. 57, No. 8, 6233).

Visagie, T.R. (1988): Maturity index of apricots. Deciduous fruit grower, 38(7): 237-238 (En. AF, 2 ref.) fruit and fruit Technology Research Institute, Stellenbosch, South Africa. Hort. Abs. 59 (7): 5557).

---

of guava Psidium-guajava fruit for processing.

Visanska, Ju.; Doncer, D. and Velkov, L. (1970): The effect of harvesting time and temperature regime in cold stores on the results of storing the pear varieties Cure and Passe Crassane. Grad Lozar. Nauka., 7(7): 1118. (Hort. Abst. 41: 853).

Wells, J.N. (1971): Postharvest hot-water and fungicide treatments for reduction of decay of California peaches plums and nectarines. USDA, Agr. Res. Ser. Marketing Res. Rep. No. 908.

Westwood, M.N. (1962): Seasonal changes in specific gravity and shape of apple, pear, and peach fruits. Proc. Amer. Soc. Hort. Sci., 80: 90-6.

Wills, A. and Gartner (1958): Chemical and physical developmental of the pin apple fruit IV. Plant pigment constituents (Hort. Abst. 1958, No. 19989).

Wills, R.S.H.; Mulholland, E.E.; Brown, B.L. and Scott, K.J. (1983): Storage of 2 new cultivars of guava *Psidium-guajava* fruit for processing. Sch. Food. Technol., Univ., New South Wales. Trop Agric. 60(3): 175-178.

Wolf, J. (1958): A contribution to our knowledge of the organic acid in the course of fruit development. Planta, 51: 547-65. bibl. 26. (Hort. Abst. 1958, No. 3368).

Wohmuth, N. (1954): The chemical composition of ripening fruit. Mitt klosternivberg, Ser. B., 4: 235-49. bibl. 11. (Hort. Abst. 1958, No. 1153).

Yagi, M.I. (1976): Preliminary post-harvest studies on guava fruit. Food Res. Cent., Shabat, Sudan, J. Food Sci., Technol 8: 68-79.

Yong, S.L. (1945): Experiments on the storage of citrus fruits in fuchow (chinese). Pukien Agric. J., 72: 792103. (Hort. Abst., 18: (3036), 1948.)