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REPLACEMENT

# Oregon Tree Fruit and Nut Research Abstracts 1970-1971

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Oregon Tree Fruit and Nut Research Abstracts  
1970-1971  
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Compiled by M. N. Westwood

Introduction

The index which follows is complete through 1971 and includes all of the abstracts from Special Report 341 plus items 290 through 341 of the attached supplement. For best use of the abstract supplement, it should be attached to Special Report 341.

As was done with the earlier compilation, full reprints of papers 290 through 341 will be filed under the same numbers in the libraries of the Branch Stations at Hood River and Medford and in the Horticulture Department library at Corvallis. This was done for the convenience of extension workers and others who might need to study the full report from which the abstract was taken.

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## PAPER ABSTRACTS

290. Becker, Manning and Garvin Crabtree. 1963. Economics of weed control in orchards. *Ore. Hort. Soc.* 55:93-95.---Costs per acre of recommended rates of herbicides for weed control in orchard crops are relatively easy to obtain. Application costs and the expenses of alternative methods of weed control must be determined for a specific management unit. When this information is available it can be applied to a standard budget form to determine the economic benefit from a given weed control program. Factors that may be difficult to assess and therefore would not be included in the economic evaluation, may be very important in making a decision on the type of weed control program to be used in an orchard.
291. Roberts, A. N. and L. T. Blaney. 1967. Qualitative, quantitative, and positional aspects of interstock influence on growth and flowering of the apple. *Proc. Amer. Soc. Hort. Sci.* 91:39-50.---A 6-year study conclusively showed that length and position of dwarfing (East Malling IX) and invigorating (East Malling XVI) interstocks in composite apple trees influenced tree size, onset of flowering, or both. Reciprocal interstock/rootstock combinations of 3-, 6-, and 12-inch EM IX and EM XVI (EM IX/EM XVI and EM XVI/EM IX) were top worked with 'Starking Delicious' scions. Positional effects were determined by inserting the interstocks 3 inches above ground-level in one series and 12 inches above ground in another. All trees were headed at the same height. Growth analysis consisted of extension growth, trunk cross-sectional area, percentage bloom and set, and fruit yield. Root tissue had the dominant influence. The initial response to EM IX, proportional to its length as an interstock, was earlier and greater flowering. Contrary to the widely held opinion, that growth reduction induces flowering, reduction in tree size followed later as a result of heavier cropping. The EM XVI interstock favored increased tree size, but did not influence flowering. These results support the view that onset of flowering in young trees is not dependent on growth reduction and suggest that vegetative and reproductive responses in apple involve closely related, yet distinct systems. Fruit yields expressed the degree of balance between tree vigor supplied by EM XVI, which determined fruit-bearing surface, and flowering stimulus supplied by EM IX, which determined flower number and fruit set.
292. Beavers, D. V., C. H. Payne and R. F. Cain. 1971. Brined cherries - quality and yield as affected by maturity at harvest, delay before brining, brine composition and added hardening agents and prebrining. *Ore. Agr. Expt. Sta. Tech. Bull.* 118, 36 pp.---In an evaluation of the variables of maturity, delay before brining, brine composition, effect of added hardening agents and "prebrining" on the quality and yield of brined cherries, it was confirmed that solution pockets occur more frequently as the maturity increases, and as the harvest season progresses. Conditions which decreased water pick up, and decreased turgor decreased the incidence of solution pockets. The greatest effect upon decreasing solution pockets occurred when cherries were held at room temperature for 12 hours before brining. Brine shrink, pitting loss and total loss decreased as the harvest season progressed. Texture decreased as the harvest season progressed, and as the fruit became more mature. The brining variables of pH, SO<sub>2</sub> concentration and neutralizing agents had no effect upon solution pocket

formation or upon pitting loss. Brines neutralized with magnesium and sodium hydroxide did not produce commercially acceptable cherries. Brine shrink and total loss decreased and the texture became more firm as the  $\text{SO}_2$  concentration increased probably due to the secondary effect of increased calcium, rather than a direct result of  $\text{SO}_2$  concentration. Raising the initial pH of the brine caused an increased firming of the cherries again probably due to increased calcium content. None of the treatments with added hardening agents produced an important effect upon solution pocket formation. Brine and total shrink progressively decreased with increasing concentrations of calcium chloride or alum. Alum gave the least shrink in all instances. Texture increased with calcium chloride additions up to and including 1% (3200 ppm of calcium). Calcium chloride prebrines reduced solution pocket formation, but the cherries were seriously discolored. Cherries prebrined in NaCl concentrations below 4%, alum solutions, or dextrose solutions were severely cracked. The prebrine mix of 3% NaCl plus 3%  $\text{CaCl}_2$  decreased solution pockets. The fruit was bright colored and firm at all stages of the process. The combination prebrine decreased brine shrink, increased texture, decreased the soft fruit slightly, and increased No. 1 grade fruit. The most important attribute of the combination brine is the immediate hardening effect it produces. Prebrines will mold or ferment, and it would be a dangerous policy to re-use the prebrines again without pasteurization.

293. Coyier, Duane L. 1971. Control of powdery mildew on apples with various fungicides as influenced by seasonal temperature. Plant Dis. Rptr. 55(3): 263-266.---Severity of powdery mildew caused by Podosphaera leucotricha was evaluated on 'Red Rome' apple trees in 1970 after spraying with several new fungicides for three seasons. The level of infection in sprayed and unsprayed trees decreased as the temperature increased during the period from full bloom to midsummer.
294. Zwick, R. W., S. C. Jones, F. W. Peifer, R. W. Every, R. L. Smith and J. R. Thienes. 1970. Malathion ULV aerial applications for cherry fruit fly control. J. Econ. Ent. 63(5):1693-1695.---Control of the cherry fruit fly by the application of 1.0 pt of malathion technical as an ultra low volume (ULV) application to commercial cherries was demonstrated in 1968-69 in The Dalles and Eugene, Ore. areas. Excellent control of infestation was obtained with the applications made from fixed wing or rotary winged aircraft at the above dosage applied each 7 days from the first emergence of the fruit fly. Residues were well within established tolerances for malathion 1 day after application.
295. Zwick, R. W., F. W. Peifer and F. E. Ellertson. 1970. Field-plot and laboratory screening of chemical control agents against Pleocoma larvae. J. Econ. Ent. 63(5):1573-1576.---Ten insecticides and 2 soil fumigants were screened in the field and laboratory as possible controls for Pleocoma spp. grubs which attack the roots of deciduous fruit trees. Heptachlor and Dursban<sup>®</sup> (O,O-diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate) insecticides and ethylene dibromide and Vapam<sup>®</sup> (sodium N-methyldithiocarbamate) soil fumigants produced some mortality, but effective economic control of larvae in infested orchards using the registered compounds tested and conventional dispersal methods does not appear promising in view of the high dosages needed to produce significant larval kill.

296. Palmer, B. C. and H. R. Cameron. 1971. Comparison of plant-pathogenic pseudomonads by disc-gel electrophoresis. *Phytopath.* 61(8):984-986.---Thirty-eight isolates representing Pseudomonas syringae, P. morsprunorum, P. phaseolicola, P. lachrymans, P. glycinea, P. fluorescens, and P. aeruginosa were compared using disc-gel electrophoresis and physiological and pathogenicity tests. Electrophoretic data confirmed the close relationship among the oxidase-negative plant pathogens, as well as their distinction from the saprophytic species. Protein band patterns for P. glycinea, P. phaseolicola, and P. morsprunorum were quite similar, and could be distinguished from the other species by the occurrence of a densely staining band above the two frontal bands. Patterns of P. syringae and P. lachrymans were similar in many respects, and were distinguishable from the others. Pseudomonas fluorescens and P. aeruginosa were distinct from any of the other isolates tested. The data support the placing of the oxidase-negative plant pathogens in a single taxospecies. However, distinctions within this group can be made at the subspecies level by some physiological tests and gel electrophoresis.
297. Cameron, H. R. 1970. Pseudomonas content of cherry trees. *Phytopath.* 60(9):1343-1346.---The systemic distribution and frequency of Pseudomonas spp. was determined within diseased and healthy-appearing sweet cherry trees (P. avium). Fluctuations in both bacterial distribution and frequency occurred during the seasons, and could be correlated with variations in available moisture and temp. Highest populations were in early spring, with a moderate increase after the first fall rains. Lowest populations were in midsummer and during the coldest weeks of winter. The systemic existence of Pseudomonas syringae Van Hall. helps to explain the lack of effective control from protective bactericides applied to the surface of trees.
298. Cameron, H. R. 1970. An undetermined disease of filbert. *Plant Dis. Rptr.* 54(1):69-72.---An undetermined disease of filbert (Corylus avellana) has been spreading slowly in western Oregon. Symptoms consist of severe reduction in leaf size, tree growth and nut set. To date it has not been possible to reproduce the symptoms with soil fungi, nematodes, nutritional deficiencies or graft inoculations. Because of the potential danger to the filbert industry, attempts have been made to eradicate the disease. The name filbert stunt is proposed for the described disease.
299. Cameron, H. R. 1971. Effect of root or trunk stock on susceptibility of orchard trees to Pseudomonas syringae. *Plant Dis. Rptr.* 55(5):421-423.---The severity of bacterial canker (Pseudomonas syringae) is related to the susceptibility of the root or trunk stock as well as to the susceptibility of the scion cultivar. Under Oregon conditions the sweet cherry 'Corum' is the most resistant of the present commercial cultivars. About half as many 'Italian Prune' trees had trunk cankers when grown on peach seedling rootstocks as trees on plum rootstocks. Pseudomonas infection was particularly severe on trees with Prunus tomentosa rootstock.
300. Cameron, H. R. 1971. Relationship of host metabolism to bacterial infection. Third Int. Conf. on Plant Pathogenic Bacteria, Wageningen, Neth. 55 pp.---Infection of plants by bacteria has usually been described as being initiated by the pathogen. Evidence is now accumulating that in some hosts potentially virulent pathogenic bacteria may exist on and in apparently healthy plants without inciting disease symptoms. These

pathogenic bacteria appear to comprise a small percentage of the normal flora but as isolation and observation techniques become more definitive, there is increasing evidence of their existence. If these potential pathogens are commonly present on and in host tissue, and are not inciting disease symptoms, then the problem is one of determining what factors permit them to become pathogenic. Some reports, based on work in woody plants, suggest that the first step is a change in host metabolism that increases susceptibility. This change may be in nutrient level, in the water content of the host, or in phytohormone concentration. Since these factors may interact and are influenced by climate, horticultural practices, and genetic composition, it is difficult to determine which factor or factors permit infection. A determination of these factors, and subsequent manipulation of them when possible, may result in commercially adequate control of some diseases incited by bacteria.

301. Cameron, H. R. and B. C. Palmer. 1971. Gel electrophoresis as a tool for diagnosis. Third Int. Conf. on Plant Pathogenic Bacteria, Wageningen, Neth. 55 pp.---Gel electrophoresis has recently been used as a method of determining protein composition for species and intra-species comparisons. We have used this technique to make comparisons between pathogenic and non-pathogenic isolations of Pseudomonas and in a search for protein differences between isolates from specific hosts. Similarity of protein band patterns obtained by gel electrophoresis suggested that the oxidase-negative plant pathogenic species form a distinct group from the non-pathogenic species. Within the pathogenic species similar band patterns indicated possible synonymy; however, pattern differences could not be correlated with host specificity. Bacterial cells were grown in an aeriated liquid media and concentrated by centrifugation. Soluble proteins were extracted by sonication, then centrifuged and frozen. The protein fraction was applied above an acrylamide gel and separated by electrophoresis. The protein bands were stained with Coomassie blue and the patterns recorded with a spectrodensitometer. Gels were compared by using major homologous bands as reference points to be sure identification of minor bands was accurate. Protein band patterns were consistent over extended periods of time and with known isolates from the same source.
302. Swenson, K. G. 1971. Relation of age, sex, and mating of Macrosteles fascifrons to transmission of aster yellows. Phytopath. 61(6):657-659.---The effects of sex, mating, and age when pathogen was acquired on transmission of aster yellows by Macrosteles fascifrons are reported. Fewer 1st-instar nymphs than adults became inoculative during 2 days on diseased plants. The nymphs that became inoculative transmitted as frequently, but no more so, than did adults. Males transmitted less frequently than did females. No effects on transmission due to mating were observed.
303. Swenson, K. G. 1971. Environmental biology of the leafhopper Scaphytopius delongi. Annals of Ent. Soc. Amer. 64(4):809-812.---Scaphytopius delongi Young had a facultative diapause. It produced eggs in a state of pre-embryonic diapause in response to 10-hr daylengths and a continuous series of generations at 16-hr daylengths. The diapause response to short days was not offset by night temperatures up to 24.6°C. There was a linear relationship between duration of the nymphal period and mean temperature from 19.9 to 29.3°C. The preoviposition period was determined for several environments but was not linearly related to mean temperature. The

duration of the oviposition period, number of eggs laid, and longevity also were determined in several environments.

304. Swenson, K. G. 1971. Relation of sexupara production in the woolly pear aphid, Eriosoma pyricola (Homoptera: Pemphigidae), to tree growth in the field. Can. Ent. 103:256-260.---Sexupara production in the pear root aphid, Eriosoma pyricola Baker & Davidson, was closely associated with the cessation of shoot growth of its host in the field in irrigated and non-irrigated plots in two successive, but phenologically different years. Neither the environment nor the host plant were unfavorable at the time the sexuparae were formed, indicating that the aphid uses the host plant as a source of seasonal information. The nature of synchronization between active development of univoltine insects and trees is discussed. It is concluded that the initiation of dormancy in trees and diapause in insects is not likely to be synchronized by a common set of environmental factors. Either regulation of insect diapause by host trees is more common than is currently recognized, or environmental and age differences in tree growth have favored selection for obligate diapause.
305. Westigard, P. H. and L. D. Calvin. 1971. Estimating mite populations in southern Oregon pear orchards. Can. Ent. 103:67-71.---Studies were conducted in southern Oregon pear orchards to develop sampling methods for assessment of mite abundance. Those species included in the investigation were the two-spotted spider mite, Tetranychus urticae Koch; European red mite, Panonychus ulmi (Koch); yellow spider mite, Eotetranychus carpini borealis (Ewing); and the predaceous phytoseiid, Typhlodromus occidentalis Nesbitt. The results show that five leaves on one limb per tree are adequate to include representative numbers of the four mite species. Variation in mite densities between trees, even of the same variety, was quite high. The sample size (numbers of trees) required for assessing mite density can be calculated provided that an estimate of the coefficient of variation ( $s/x$ ) is available.
306. Westigard, P. H. and D. W. Berry. 1970. Life history and control of the yellow spider mite on pear in southern Oregon. J. Econ. Ent. 63(5): 1433-1437.---Life-history and control studies of Eotetranychus carpini borealis (Ewing) were made in southern Oregon pear orchards between 1965 and 1968. Under laboratory conditions overwintering females laid on an average of 6 eggs compared with 36 for summer females. Both averages were below those of the two-spotted spider mite, Tetranychus urticae Koch, which were 38 and 100 eggs for overwintering and summer females, respectively. In results from field studies, comparisons of the intra-tree distribution of the yellow spider mite and the two-spotted spider mite revealed a high degree of overlap, but the former was found more evenly distributed over the entire tree. Resistance to phosphate insecticides by E. borealis was reported in 1958, but in 1965 field application of ethion and carbo-phenothion gave commercial control. By 1968 a definite tolerance to ethion was again apparent. In field tests several newer materials were effective including: Chloropropylate® (isopropyl 4,4'-dichlorobenzilate), Fundal® (N'-(4-chloro-o-tolyl)-N,N-dimethylformamidinium hydrochloride), formetanate, Galecron® (N'-(4-chloro-o-tolyl)-N,N-dimethylformamidinium, Lovozal® (phenyl 5,6-dichloro-2-(trifluoromethyl)-1-benzimidazole carboxylate), Plictran® (tricyclohexyltin hydroxide), and UC-34096 (4-[[[(dimethylamino)methylene]amino]-m-tolyl methylcarbamate hydrochloride). Oil sprays of Volck Supreme or Orhex 796 also were effective.



307. Westigard, Peter H. 1971. Integrated control of spider mites on pear. J. Econ. Ent. 64(2):496-501.---Spider mite densities were low in pear orchards left untreated with pesticides for several years. The year following discontinuance of sprays, the two-spotted spider mite, Tetranychus urticae Koch, caused some defoliation but in subsequent years was not found in destructive numbers. Densities of the European red mite, Panonychus ulmi (Koch), increased until the 4th year after summer sprays were no longer applied. The principal agent in spider mite control was thought to be a phytoseiid, Typhlodromus occidentalis Nesbitt. Attempts were made to increase the number of T. occidentalis in commercial pear orchards by reducing the rate of azinphosmethyl used for summer control of the codling moth, Laspeyresia pomonella (L.). A rate of 0.5 lb AI/acre allowed predator's survival and gave good control of the moth. Summer oil was added for suppression of the European red mite. Conversion from a standard program, which included several synthetic acaricides, to the integrated program resulted in economic injury from spider mites the 1st year, but in the 2nd and 3rd years the predaceous phytoseiid held the two-spotted spider mite below injurious levels.
308. Gay, Lloyd W., Robert L. Stebbins and Robert M. Black. 1971. The effect of spray irrigation on plum temperatures. Northwest Science 45(3):200-208.---Eight trees in an Early Milton plum orchard in western Oregon were cooled by spraying each afternoon throughout the summer in an attempt to minimize heat damage that has frequently been observed in the fruit of this species. This study reports temperature contrasts observed between sprinkled plums and unsprinkled controls during afternoon spray periods in late August, 1967, with ambient air temperatures averaging about 30°C in the control portion of the orchard. Results, obtained at the plum pit with fine-wire thermocouples, show that fruit on sprinkled trees typically averaged about 4°C below ambient, while fruit on control trees averaged about 3°C above ambient. Aspect played an important role in the plum temperature regimes. North side plums averaged about 6°C cooler than ambient on sprinkled trees and were about 1°C warmer on the unsprinkled control trees. Plums on the exposed south sides averaged just below ambient when sprinkled and reached about 5°C above ambient when unsprinkled. Consideration of the plum energy balance suggests that convection between the sprinkled plums and the evaporatively cooled orchard air contributed most of the observed cooling. Conduction and evaporation at the plum surface were judged to play a minor role in the cooling process.
309. Stebbins, Robert L. 1971. The influence of tree nutrition on yield and quality of pears and apples. Proc. Ore. Hort. Soc. pp. 37-41.---A general discussion of mineral nutrition in pear and apple orchards covering nitrogen, phosphorus, potassium, magnesium, calcium, boron and zinc. Methods of determining fertilizer needs, consequences of mineral-nutrient deficiencies and methods of prevention and control of mineral deficiencies are discussed. Research results from nitrogen experiments on apples in Colorado, potassium on pears in Oregon, magnesium in Oregon and boron in New York are mentioned. A discussion of foliar feeding mixes is included.
310. Wang, C. Y. and E. Hansen. 1970. Differential response to ethylene in respiration and ripening of immature 'Anjou' pears. J. Amer. Soc. Hort. Sci. 95(3):314-316.---Treatment with 500 ppm ethylene for 24 hr or with 4000 ppm Ethrel (2-chloroethanephosphonic acid) dip for 30 sec resulted in

'Anjou' pears attaining full ripeness without a concomitant change in respiratory activity. A decrease in flesh firmness and increases in protein nitrogen and soluble pectin occurred, even though the fruit remained in the preclimacteric condition. This was shown by a positive response in rate of respiration to ethylene at the fully ripe stage. Continuous, 48- and 24-hr treatments resulted in comparable rates of ripening. However, while the continuous and 48-hr treatments induced the climacteric rise in respiration, the 24-hr exposure failed to do so. The effect of ethylene on respiration is independent from its effect on the initiation of ripening; a respiratory response probably requires a higher concentration or longer exposure to ethylene than does a ripening response.

311. Lombard, P. B., C. B. Cordy and E. Hansen. 1971. Relation of post-bloom temperatures to 'Bartlett' pear maturation. J. Amer. Soc. Hort. Sci. 96 (6):799-801.---Temperatures for several post-bloom periods were correlated with days from full bloom to 'Bartlett' pear maturity. Date of maturity based on pressure test showed a high negative correlation ( $r = -.88$ ) with mean temp above 40°F for the 36 days following bloom. The peak thermal period occurred 26-30 days after bloom, with the highest correlation on the 28th day. Days to maturity had a higher correlation with accumulated mean temp above 45°F than with degree hr above 45°F for the same periods. Base temp of 38.5°F to 50°F gave  $r$  values greater than  $-.85$  in this prediction method. Mean temp between 41.5°F and 68.5°F on the 28th day had a linear correlation  $r$  of  $-.71$  with days to maturity. Equal temp increments were more effective at min levels than at max levels for accelerating maturity. The post-bloom thermal period affecting maturation coincides with the stage of cell division and most effective time for application of chemical thinning sprays.
312. Challice, J. S. and M. N. Westwood. 1970. Pyrus species. Long Ashton Res. Rpt. pp. 63-65.---New flavone glycosides were found in P. ussuriensis from Korea. A survey of leaf phenolics in an authentic Pyrus collection caused us to revise previous generalizations in that some East Asian pears contain no flavones while some African and European species do. Analyses of blight susceptible and resistant P. communis indicated no correlation between leaf or bud phenolics and resistance to fire blight. There were differences in phenolics among the various kinds of tissue, e.g. stem, xylem, phloem, etc. Observations of flowering dates relative to Williams indicated that some Kew specimens were not authentic. Pyrus were used in a numerical taxonomy model, where 21 characters were studied in a computer-generated classification. Three distinct groups of species were found based on the single-linkage cluster analysis, showing most European species to be closely related, while East Asian species separated into two groups. Stereoscan electron microscopic studies of Pyrus anthers and pollen indicate a few distinct surface features of value in taxonomy. Disease and insect resistance in 8 Pyrus species was not related to leaf phenolics.
313. Westwood, M. N. and H. O. Bjornstad. 1971. Some fruit characteristics of interspecific hybrids and extent of self-sterility in Pyrus. Bull. Torrey Bot. Club 98:22-24.---Eight species tested showed a high degree of self-sterility, including P. fauriei which was reported earlier to be self-fertile. Many interspecific crosses were fertile, but of the 31 crosses which were not, more than half involved either P. fauriei or P. heterophylla.

Fruits of interspecific hybrids showed that persistent calyx was dominant over deciduous, russet skin was dominant over smooth, and stoneless flesh was dominant over stony. Carpel number was intermediate between the two parent species.

314. Westwood, M. N., H. R. Cameron, P. B. Lombard and C. B. Cordy. 1971. Effects of trunk and rootstock on decline, growth and performance of pear. J. Amer. Soc. Hort. Sci. 96(2):147-150.---Pear plots established in 1923 and 1926 with trees composed of several rootstock and trunk combinations were assessed for tree size, susceptibility to pear decline and for fruit quality. In general, Pyrus ussuriensis Max. and P. pyrifolia Burm. & Nak. rootstocks resulted in small trees, P. communis L. and P. calleryana Decne. intermediate, and P. betulaefolia Bunge large. The latter was most resistant to decline, followed by P. calleryana and P. communis, with P. pyrifolia and P. ussuriensis susceptible. The use of the oriental hybrid cvs. Variolosa and Tolstoy as interstocks increased the severity of pear decline symptoms though all trees were not uniformly susceptible. The use of the P. communis cv. Old Home as a scion rooted trunkstock decreased the degree of decline. Fruit quality was good on most combinations but was generally better on P. calleryana than other rootstocks. Pyrus betulaefolia caused cork spot and poor quality of 'Anjou' but this same rootstock resulted in outstanding quality of 'Seckel'.
315. Challice, J. S. and M. N. Westwood. 1971. Phenolic compounds of the genus Pyrus: A comparative study of specimens selected for resistance and susceptibility to disease. Phytochem. 10:1-8.---The progeny from intra-specific crosses made within Pyrus betulaefolia, P. pashia, P. elaeagnifolia, P. amygdaliformis, P. communis, P. calleryana, P. fauriei and P. ussuriensis have been screened for disease resistance (chiefly fireblight, Erwinia amylovora (Burr.) Winslow et al., but some for the woolly pear aphid, Eriosoma pyricola Baker and Davidson, and crown gall, Agrobacterium tumefaciens (E. F. Smith and Town, Con.) and the presence of phenolics. In some instances the presence of certain phenolics appears to coincide with disease resistance but the overall conclusion is that there is no actual connection between phenolics and disease resistance.
316. Westwood, M. N., M. M. Thompson and P. B. Lombard. 1971. Pyrus species and pear cultivar germ plasm collection in Oregon. Amer. Pom. Soc. Fruit Var. & Hort. Dig. 25(4):87-89.---Oregon's Pyrus germ plasm collection is described. Included are 187 French varieties (P. communis), 6 Japanese varieties (P. pyrifolia), 17 Chinese varieties (P. ussuriensis) and a number of P. ussuriensis hybrids. Also, a recent addition to the W-6 collection are authenticated populations of the 22 primary Pyrus species of the world. The use of this collection in various research programs indicates 17 uses of the material in this country and in Europe.
317. Westwood, M. N. 1970. Rootstock-scion relationships in hardiness of deciduous fruit trees. HortScience 5(5):418-421.---One of the key limiting factors in fruit production is bud or tree damage from fall or winter freezes. This is due to the selection of cultivars by criteria other than hardiness and to man's attempt to extend otherwise good cultivars beyond their hardiness range. Damage from a freeze varies between root, trunk, twig and bud and is further complicated by the fact that at least 2 and sometimes 3 genetic systems are involved. Three-piece

genetic systems have a root of one type on which is grafted a trunk or frame of a special type, which in turn is worked to the scion variety. These compound genetic systems, physiologically complex, are even more complex in hostile environments which result in cold injury to one or more organs or genetic systems. Also several other factors influence the extent of cold injury. Such factors as nutrient deficiencies or excesses, diseases and pests, previous crop density, irrigation, tree vigor, pruning, pre-conditioning temperatures, short-term temperature variations, and the time at which the freeze occurs all affect the extent of injury. Mechanisms inducing dormancy and rest in plants are important because actively growing tissues are damaged more than dormant ones at a given temperature. While these mechanisms are partly understood for simple plants, their interactions in compound genetic systems are poorly defined. Various known effects of rootstock-scion combinations and their interactions with climate and culture are reviewed.

318. Westwood, M. N. 1971. Pea pears show ornamental value. Ore. Orn. and Nurs. Dig. 15(2):1 and 4.---The pea pears and other small fruited forms offer several possibilities as ornamentals. P. fauriei and P. heterophylla are dwarfs, several are medium, and P. betulaeifolia is a large tree. Various traits such as leaf color, bark color, autumn coloration and soil and climate tolerances are noted.
319. Westwood, M. N. and A. H. Williams. 1970. Malus species: Authenticity of the collection. Long Ashton Res. Rpt. pp. 65-66.---Studies at Long Ashton help establish that there are probably only 14 true Malus species. Authenticity was based on phenology, morphology, botanical characters, breeding behavior and geographic distribution. Polyphenolics among many assumed species and types from arboretums were very variable, indicating mislabeling or hybrid forms.
320. Westwood, M. N. 1970. What will it be -- mini or super-dense mini? Amer. Frt. Gr. 90(4):24-26.---It was shown that yield per tree is similar regardless of spacing during the first few years. Thus, yield per acre is proportional to the number of trees per acre. Efficient combinations of varieties and rootstocks can provide high early yields either with dwarfs or with standard trees in filler systems. Medium densities of 200 to 400 trees per acre can be maintained with standard root on a weak soil, low N and heavy pruning, but high densities of 600 to 1,000 trees per acre must be on dwarf roots to be useful. Full mechanization of pruning and harvesting is best achieved with full dwarf tree walls.
321. Westwood, M. N. 1971. Apple and pear research in Oregon. Ore. Hort. Soc. Proc. 62:21-30.---The author has summarized the several kinds of work being done on apples and pears from several disciplinary areas. Studies are noted in the areas of fruit set, thinning, frost control, weed control, rootstocks, varieties, nutrition, maturity, harvest and storage, insects and mites, diseases, marketing and economics, and general culture.
322. Westwood, M. N. 1971. Biochemistry and resistance to fire blight. Ore. Hort. Soc. Proc. 62:41-42.---Men have for years been looking for the chemical basis of blight resistance in pear. One theory is that resistance is related to the polyphenol arbutin and its breakdown product, hydroquinone, in conjunction with enzyme activity of  $\beta$ -glucosidase. Recent studies at Long

Ashton indicate that there appears to be no relationship between the type or concentration of phenolics in pear tissue. Recently it was found that fire blight bacterium is associated with a phage and that the white strain is pathogenic but the yellow form is not.

323. Sikstrom, M., R. Lucich, N. Looney and M. N. Westwood. 1970. What can we do to increase returns to the pear grower? Proc. Brit. Col. Frt. Gr. Assoc. 2:81-86.---Fruit set of 'Anjou' pear is often increased by higher N application and vigorous pruning. These may decrease set on other varieties. Winter pruning of fruit trees may result in severe winter injury if a hard freeze occurs within a week of the pruning. P. calleryana is a good pear rootstock in mild climates, but it sustains severe winter damage in B.C. or other areas with cold winters. Even when all P. calleryana tissue is below ground line, the varietal top suffers winter injury.
324. Westwood, M. N. 1970. Some possibilities in pear production. Proc. Brit. Col. Frt. Gr. Assoc. 2:77-80.---Ways are considered for achieving maximum yield of pears. The principle of limiting factors is discussed, pointing out that such decisions as spacing, rootstock type, variety, pollenizers, soil and site are very important because they are once-only decisions and cannot be changed from year to year as can practices such as weed control, pest control, pruning and fertilizers. Potential production cannot be realized if one of the key fixed factors in establishing new orchards is seriously limiting.
325. Lombard, Porter, Mel Westwood and Maxine Thompson. 1971. Effective pollination - the facts of life behind uniform pear cropping. Proc. Ore. Hort. Soc. 62:31-36.---The following factors were found to increase pear set: cross rather than self-pollination, high rather than low temperature, good mite control, close proximity to pollinizer, previous chemical thinning, dormant oil spray, open space (border effect) and pruning ('Anjou'). Seeded fruits were larger than seedless. Effective pollination period, i.e. the longevity of the embryo sac minus the time required for pollen tube growth, varied from two days at 45°F with selfing to nine days at 60°F with crossing.
326. Chaplin, M. H. and A. L. Kenworthy. 1970. The influence of succinamic acid 2,2-dimethyl hydrazide on fruit ripening of the 'Windsor' sweet cherry. J. Amer. Soc. Hort. Sci. 95(5):532-536.---Field experiments were conducted in 1967 and 1968 to determine the influence of succinamic acid 2,2-dimethyl hydrazide (SADH) on fruit ripening of the 'Windsor' sweet cherry. Foliar sprays of 1000, 2000 or 4000 ppm of SADH were applied to mature 'Windsor' trees. SADH promoted anthocyanin development by two weeks and sugar development by one week without significantly reducing fruit firmness. Treated fruits, however, were smaller than non-treated fruits of comparable color and sugar content. Fruit respiratory activity was not affected by SADH treatment. It is postulated that SADH acts directly on the enzyme systems concerned with anthocyanin and sugar biosynthesis rather than acting at the hormonal level to advance the general physiological maturity of the fruit.
327. Chaplin, M. H. 1971. Fact and fallacy of foliar feeding. Proc. Ore. Hort. Soc. 62:47-52.---1. The major elements usually cannot be supplied in amounts great enough to overcome deficiencies by foliar means. 2. Foliar sprays should be applied on the basis of need which can be determined visually

or by leaf analysis. 3. Foliar sprays may cause phytotoxicity, especially when large amounts of the major elements are applied. 4. The application of a mixture of minor elements will not improve plant performance unless there is a demonstrated need for each element. 5. Of all the elements most commonly deficient, zinc and boron are the best adapted to foliar sprays. The cost of commercial compounds containing these elements is usually higher than that of the straight chemical compounds.

328. Chaplin, M. H. 1970. Some observations on the mechanical harvesting of sweet cherries. Proc. Ore. Hort. Soc. 61:51-55.---Criteria which should be satisfied before mechanical harvesting of sweet cherries could become practical are: 1) the integrity of the trees should be maintained; 2) fruits should be removed with a minimum of bruise and structural damage and be free of dirt; 3) at least 90-95% of the fruits should be removed; and 4) fruit should be removed with stems attached. Observations of the 1969 harvest season indicate that sweet cherry trees can be harvested with minimum visible damage to the trees. The other criteria were not met. Fruits harvested were severely bruised and had low stem counts. A great percentage remained on the trees.
329. Chaplin, M. H. 1970. Stone fruit fertility research programs for the seventies. Proc. Ore. Hort. Soc. 61:87-89.---The following nutritional problems have been identified in Oregon stone fruit orchards and will be the subjects of intensive research in the 1970's. 1. Low N and K levels; high Mn levels. 2. Low efficiency of fertilizer usage. 3. Low pH and base saturation of orchard soils. 4. Use of foliar sprays for the major nutrients (N, K, P, Ca, Mg). 5. Effect of rootstocks on nutrient content and subsequent fertilizer requirement. 6. Effect of high density plantings on nutrient need.
330. Chaplin, M. H. 1969. The concept and uses of leaf analysis in nut production. Proc. Wash. and Ore. Nut Growers' Soc. 55:39-41.---There are three important phases associated with any leaf analysis program: 1) determination of the nutrient elements contained in the leaf sample; 2) interpretation of the leaf element data; and 3) prescription of a fertilizer suggestion based on the leaf content. Leaf analysis may be used to determine the nutrient element associated with an apparent disorder and as a tool in the estimation of fertilizer needs prior to the occurrence of nutrient disorders.
331. Langmo, R. D. 1970. Evaluating packaging objectives. Proc. Packaging for Marketing Seminar, Nat. Peach Council, 907 Clayworth Dr., Manchester, MO 63011, 13 pp.---Objectives of packaging are defined and methods of evaluating container and package performance are described. The techniques are illustrated with examples of packaging relating to agricultural commodities.
332. Thompson, Maxine. 1971. Recent trends in cherry varieties. Ann. Rpt. Ore. Hort. Soc. pp. 56-59.---An evaluation of the current varietal situation in sweet cherries in Oregon. Progress in pollenizers and prospects for developing the traits of self-fertility and compact growth habit in future varieties are discussed. Desired objectives in new varieties are outlined.
333. Thompson, Maxine. 1971. Pollen incompatibility in filbert varieties. Proc. 56th Ann. Meeting Nut Growers' Soc. Ore. and Wash. pp. 73-79.---

An analysis of the current state of knowledge about self- and cross-incompatibility in filberts. The method of testing compatibility is given. A table summarizes results of 70 varieties tested at OSU for pollen compatibility on 'Barcelona'. Forty-six varieties were compatible and 24 were incompatible. The necessity of choosing a compatible variety for a pollinizer was stressed.

334. Doran, Samuel M. and A. Gene Nelson. 1971. Analyzing an orchard enterprise. OSU Coop. Ext. Ser. SR 344, 17 pp.---This handbook summarizes the procedure for analyzing orchard enterprise costs and returns using a computer program available through the Department of Agricultural Economics, Oregon State University. The analysis is most effective in a group effort where the participants report the physical and financial information for their orchard enterprise. The information from similar enterprises is then forwarded to the University for simultaneous processing. Each grower receives a report comparing his operation with averages for the group.
335. Lagerstedt, H. B. 1971. Filbert tree grafting. Ann. Rpt. Ore. Hort. Soc. 62:60-63.---Chip budding, splice grafting, whip grafting, the use of dormant versus growing rootstock and the influence of the root system of two rootstocks are discussed. Three essential factors for successful field grafting of filberts have been determined. These are: 1. Proper selection, handling and storage of scion wood. Fully dormant scion wood should be prevented from drying and stored at 30°F. 2. Proper timing to take advantage of warm ambient temperature. Field grafting should be delayed until mid-May and June under Oregon conditions. Filbert callusing is extremely slow at temperatures below 70°F. Prolonged scion wood storage is the key to delaying grafting this long. 3. Proper aftercare of grafts. Once callusing of the graft union has taken place, grafting bands must be removed and the union sealed with polyvinyl acetate paint to prevent drying. Whitewashing the scion is sometimes helpful in reflecting heat during June and July. Wind breakage of succulent scion shoots can be prevented by staking. Sprouts on rootstocks must be removed to promote scion growth.
336. Lagerstedt, H. B. 1971. Tree trunk protection against summer sunscald. Arborist's News 36(6):61-65.---Young filbert trees are especially susceptible to summer sunscald due to a lack of shade from a protecting foliage canopy or that provided by adjacent trees. The thin bark of nursery-grown trees is injured at the groundline, especially so if mulched with sawdust. Injured trees are stressed so that blight or other secondary problems may increase tree mortality during the second growing season. Tree guards made from newsprint matting have been the standard method of protecting filbert trees from sunscald. Their disadvantages are that they make sucker control difficult; they deteriorate rapidly at the groundline; they collect leaves and debris which shelter insects and they partially etiolate the base of the tree trunk. To eliminate some of these problems, several types of reflected paints were tested on filbert tree trunks. Most paints provided some protection, but exterior white latex was superior due to its high reflectivity, durability and relative low cost. A special three-nozzle boom for applying the latex paint is described.
337. Lagerstedt, H. B. 1971. High density filbert orchards. Ann. Rpt. Nut Growers' Soc. Ore. Wash. 56:69-72.---Height and width measurements of trees

spaced 15', 20' and 25' apart are presented for the past 5 years. The close spaced trees are approximately 2' taller and 1' narrower than those at wider spacings in the tenth growing season. This difference in tree shape is an indication of competition for sunlight. The tree's efficiency in utilizing its space in an acre was calculated from tree diameter measurements. These calculations show that after 10 years trees spaced at 15' are occupying 87% of their allotted space while those at 20' are occupying 51% and those at 25' occupy only 35% of their allotted space. Nut yields on a dry weight basis are shown for the three spacings and all harvest years to date. The close spaced trees have consistently yielded more on a per acre basis, even though for the past 3 years they have yielded less on a per tree basis.

338. Reich, J. E. and H. B. Lagerstedt. 1971. The effect of paraquat, dinoseb and 2,4-D on filbert (Corylus avellana L.) suckers. J. Amer. Soc. Hort. Sci. 96(5):554-556.---Foliar sprays of paraquat, dinoseb, and (2,4-dichlorophenoxy) acetic acid (2,4-D) each provided satisfactory control of filbert suckers. Paraquat and 2,4-D controlled vegetative regrowth to a greater extent than dinoseb. Use of oil with dinoseb increased its phytotoxicity towards filbert suckers. Suckers should be treated when less than 1 foot in height and thoroughly wetted with spray. The herbicide 2,4-D controlled large suckers better than either paraquat or dinoseb. There was no evidence of injury to the mature trees following the use of these materials.
339. Lagerstedt, H. B. 1971. Tree trunk spray boom. HortScience 6(5):455-456.---Exterior white latex paint has been satisfactory in protecting young orchard trees against summer sunscald. Brush application of latex paint to tree trunks has proved to be slow and sometimes thorough coverage at the groundline is not obtained. A 3-nozzle spray boom has been developed to solve these application problems. Directions for its construction are given.
340. Wang, C. Y., W. M. Mellenthin and Elmer Hansen. 1971. Effect of temperature on development of premature ripening in 'Bartlett' pears. J. Amer. Soc. Hort. Sci. 96(1):122-125.---Premature ripening, a physiological disorder of 'Bartlett' pears, was induced experimentally by use of temperature controlled limb cages. Exposure to 65° day and 45°F night temperatures for 3-31 days prior to harvest caused an early acceleration in ethylene production and occurrence of the climacteric rise in respiration. These changes were accompanied by fruit softening, increases in soluble pectin and protein N, a more rapid decline in malic acid as well as a decrease in the rate of citric acid accumulation. Treatments with gibberellic acid (GA<sub>3</sub>), 100 ppm, and succinic acid 2,2-dimethyl hydrazide (Alar), 1000 ppm, counteracted the effect of cool temperature exposure and retarded premature ripening. The disorder did not develop in fruit maintained at 75° day and 60° night temperatures during the experiment.
341. Mellenthin, W. M. and C. Y. Wang. 1971. Early maturity of Bartletts can be controlled. Proc. Ore. Hort. Soc. 62:44-46.---The physiological disorder of Bartlett pears termed 'premature ripening' and its symptoms are described. Cool temperatures one month prior to harvest brought about an early development and acceleration of biochemical and physiological changes normally associated with maturity and ripening. Exploratory experiments showed that certain growth regulators tended to retard this disorder.