

6. SUMMARY

This investigation was carried out in three separate experiments during the two successive seasons of 1983 and 1984 seasons at the Experiment Station of The Faculty of Agriculture, Moshtohor to investigate the effect of tree form control, soil management systems and growth regulators sprays on tree growth, flowering, fruiting and fruit quality. Sixty young "Le conte" pear trees of 5-year-old grafted on pyrus communis L. and nearly similar in their growth vigour were devoted for this study. These experiments were:

Experiment (1): Response of young "Le conte" pear trees to training methods and soil management systems.

Sixteen trees were devoted for this study to evaluate two tree training methods (modified leader and open head) in combination with two soil management systems (clean cultivation and rice straw mulching).

Experiment (2): Response of young "Le conte" pear trees to full bloom sprays with growth regulators.

Sixteen trees trained as modified leader under mulch system were treated at full bloom with the following sprays:

- 1- "Tap water" as a control.
- 2- Alar "SADH" at 1,000 ppm.
- 3- Gibberellin "GA₃" at 10 ppm.
- 4- Gibberellin "GA₃" at 20 ppm.

Experiment (3): Response of young "Le conte" pear trees to June sprays with growth regulators under different training methods.

Forty trees under clean cultivation half of them trained as modified leader and other half as open head method were subjected in late June to the following growth regulators sprays:

- 1- "Tap water" as a control.
- 2- Alar "SADH" at 1,000 ppm.
- 3- Alar "SADH" at 2,000 ppm.
- 4- Ethephon "CEPA" at 150 ppm.
- 5- Ethephon "CEPA" at 300 ppm.

The obtained results could be summarized as follows:

I- TREE GROWTH

Experiment (1)

Open head trained trees, managed by rice straw mulch gave the highest values of tree growth parameters expressed as shoot length, rate of shoot elongation, number of leaves per shoot, leaf dry weight and leaf area. Mean while, modified leader trained trees grown under clean cultivation system showed the least values for the mentioned parameters. Open head trained trees, grown under clean cultivation as well as modified leader trained trees grown in mulched plots showed nearly similar values of the concerned tree growth measurements.

Generally open head training method greatly enhanced all tree growth aspects than did modified leader training method. On the other hand, tree managed by mulch system improved all tree growth parameters than those managed by clean cultivation system.

Experiment (2)

"SADH" sprays (1,000 ppm) at full bloom greatly inhibited tree growth, since the treated trees produced the shortest shoots, the least rate of shoot elongation, the greatest number of leaves with the smallest leaf area. On the other hand, "GA₃" tree growth parameters, except that they reduced leaf dry weight and produced oblong leaves. "GA₃" concentrations seemed to be ineffective in this respect.

Experiment (3)

"CEPA" sprays (150 & 300 ppm) under both training methods used (modified leader and open head method) exerted a reduced rate of shoot elongation and smaller leaf area not only than the control but also, than "SADH" sprays (1,000 & 2,000 ppm) under the same training methods. "CEPA" sprays, on the other hand, increased number of leaves per shoot over both the control and "SADH" sprays and leaf dry weight only over the control. Moreover, "CEPA" treatments produced more drastic effect when applied to modified leader trained trees than open head trained trees. In addition, high "CEPA" level under both training methods exerted

a pronounced inhibiting effect than did low level specially under modified leader training method. "SADH" sprays at both concentrations took the same pattern of "CEPA" levels under both training methods.

2. LEAF NUTRIENTS CONTENT

Experiment (1)

Open head trained trees grown in mulch plots gave the highest values of leaf phosphorus, magnesium, iron and zinc and showed the least leaf nitrogen content. Open head trained trees grown in clean cultivated plots as well as modified leader trained trees managed by either clean cultivation or rice straw mulch were not significantly different in this respect. Moreover, different combinations of training methods and soil management systems did not affect leaf potassium, calcium and manganese contents. Leaves of modified leader trained trees, grown under clean cultivation contained the least nutrients content than those of other treatments.

Generally, neither modified leader nor open head training method statistically affected leaf nutrients content. On the other hand, the use of rice straw mulch during the course of study increased leaf content of phosphorus, potassium, calcium, magnesium, iron, manganese and zinc as compared to clean cultivation system. Leaf nitrogen content decreased in mulched trees, only in the first season.

Experiment (2)

"SADH" sprays (1,000 ppm) increased leaf content of nitrogen, phosphorus, calcium, iron, manganese and zinc. Leaf potassium and magnesium were not affected by "SADH" sprays. On the other hand, "GA₃" treatments had generally no appreciable effect on leaf nutrients content.

Experiment (3)

"SADH" as well as "CEPA" sprays under both training methods i.e. modified leader method and open head training one, increased leaf content of nitrogen, phosphorus, calcium, iron, manganese and zinc. However, significant differences were lacking between "SADH" and "CEPA" sprays under both training methods. The growth regulator concentrations used failed to show appreciable difference in this respect. Leaf potassium and magnesium were not affected by June sprays with either "SADH" or "CEPA" under the two training methods. In the meantime, training methods used did not show any apparent role on leaf nutrients content. On the other hand, leaf content of nitrogen, phosphorus, calcium, iron, manganese and zinc were increased when trees sprayed with either "SADH" or "CEPA" over the control. Meanwhile, leaf potassium and magnesium contents were not affected by various growth regulators sprays.

3. TREE FLOWERING

Experiment (1)

Open head trained trees, managed by rice straw mulch gave the highest spurs number per tree, the highest percentage of flowered spurs, the greatest number of flowers per spur, the greatest number of fruits per inflorescence and yield (kg.) per each cm.² of trunk cross sectional area. In addition, open head trained trees grown in clean cultivated plots came next in increasing the previously tree flowering aspects. Meanwhile, modified leader trained trees grown in mulched plots showed better flowering aspects than did modified leader trained trees grown in clean cultivated plots.

Generally, open head training method had an enhancing effect on all tree flowering parameters more than modified leader training method. On the other hand, mulching the soil with rice straw encouraged all tree flowering parameters concerned in this study more than clean cultivation system.

Experiment (2)

1,000 ppm "SADH" sprays caused the highest increase of spurs number per tree, inflorescences number per tree, percentage of flowered spurs, number of flowers per spur, number of fruits per inflorescence and yield (kg.) per cm.² of trunk cross sectional area. On the other hand, "GA₃" treatments (10 & 20 ppm) did not show obvious improvement of tree flowering aspects compared to the control.

Experiment (3)

"SADH" and "CEPA" sprays improved tree flowering parameters of open head trained trees than those of modified leader trained ones. Moreover, 2,000 ppm "SADH"-sprayed trees under both training methods increased spurs number per tree, inflorescences number per tree, percentage of flowered spurs, number of flowers per spurs than did 300 ppm "CEPA" sprays. Meanwhile, fruits number per inflorescence and yield (kg.) per cm.² of trunk cross sectional area were increased when trained trees by both training methods were sprayed with 300 ppm "CEPA" than when 2,000 ppm "SADH" was applied. However, low concentrations of "SADH" and "CEPA" sprays took the same line of high levels. On the other hand, high "SADH" level increased spurs number per tree, inflorescences number per tree, percentage of flowered spurs as well as number of flowers per spur, followed by high "CEPA" level. Fruits number per inflorescence and yield (kg.) per cm.² of trunk cross sectional area were improved when trees sprayed with 300 ppm "CEPA" than did 2,000 ppm "SADH" sprays. Low levels of "SADH" and "CEPA" (1,000 and 150 ppm, respectively) took the same pattern of high concentrations.

4. FLOWER BUD DEVELOPMENT

The course of flower bud initiation and differentiation passed through 8 distinct stages through the period of April 22 nd till March, 1st. of the following year. The stages are namely: dome shaped apex "vegetative or neutral (I), flattening of the apex and inflorescence primordium

as (kg.) per tree and number of fruits per tree than did modified leader trained trees. On the other hand, tree fruiting of "Le conte" pear was greatly improved when trees grown in mulched plots, hence they gave higher fruit set percentage less fruit drop percentage and higher yield either as (kg.) per tree or number of fruits per tree than those of clean cultivated trees.

Experiment (2)

The highest fruit set percentage as well as the greatest yield as (kg.) per tree or number of fruits per tree was gained when trees sprayed with 1,000 ppm "SADH". Moreover, "SADH" sprays reduced fruit drop percentage than did unsprayed trees (control), but "GA₃" treatments were more effective in reducing fruit drop percentage than "SADH" sprays. On the other hand, "GA₃" treatments greatly increased fruit set percentage, reduced fruit drop percentage and yield as (kg.) per tree and number of fruits per tree over the control. No remarkable differences were observed between low and high "GA₃" levels for tree fruiting aspects.

Experiment (3)

Interaction between training methods and growth regulators showed that 2,000 ppm "SADH"-sprayed trees, trained as open head method gave the highest fruit set percentage, followed by open head trained trees sprayed with 300 ppm "CEPA". Open head trained trees sprayed with low level of either "SADH" or "CEPA" gave similar values which were higher than the control. Meanwhile, "SADH" sprays (1,000 & 2,000 ppm) under modified leader training method increased

fruit set percentage than did "CEPA" sprays (150 & 300 ppm) under the same training method. The higher the concentration of either "SADH" or "CEPA" the more was positive effect in this respect.

As for fruit drop percentage, under both training methods, "SADH" sprays greatly reduced fruit drop percentage than did "CEPA" sprays. The lower concentration of either "SADH" or "CEPA" the more was the reduction of fruit drop percentage. Growth regulators sprays under modified leader method exerted less effect than the corresponding ones of open head method with the same pattern of effect. Meanwhile, growth regulator concentrations had no role in this respect.

Furthermore, yield (kg.) per tree followed the same trend of fruit set, hence under both training methods the highest yield was produced by 2,000 ppm "SADH"-sprayed trees, trained as open head method, followed by 300 ppm "CEPA"-sprayed trees trained as open head method. Low level of "CEPA"-sprayed trees gave higher yield than low level of "SADH"-sprayed ones under open head method. Growth regulators exerted a positive effect under open head method than those under modified leader ones. "SADH" sprays surpassed "CEPA" sprays in increasing fruit yield (kg.) under modified leader method.

Referring to fruit number per tree, "CEPA" and "SADH" sprays when applied to open head trained trees, they increased number of fruits per tree than those under modified leader method. Moreover, 300 ppm "CEPA"-sprays on open

head trained trees gave the highest number of fruits followed by 2,000 ppm "SADH"-sprayed ones, trained by the same method. Growth regulators under modified leader method took the same pattern of open head method.

Generally, high "SADH" level caused the highest fruit set percentage, followed by high "CEPA" level. Low concentrations of "SADH" and "CEPA" took the same way of high levels.

As for fruit drop percentages, "SADH" sprays decreased the percentages of fruit drop than did "CEPA" sprays. Low levels of either "SADH" or "CEPA" were more effective in decreasing fruit drop percentage than high levels.

As for yield (kg.) per tree, it took the same pattern of response to "SADH" & "CEPA" and their concentrations to that of fruit set percentage.

Regarding fruits number per tree, "CEPA" sprays (150 & 300 ppm) surpassed "SADH" sprays in this respect. The increase of fruits number per tree paralleled with the increase of growth regulator concentrations.

6. FRUIT QUALITY

6.1 Fruit physical properties

Experiment (1)

Fruits of open head trained trees, managed by rice straw mulch were almost uniform in their size and attained their maturity earlier than those of other treatments. These fruits were also longer, wider contained the greatest number of seeds and showed the least firmness in comparison

with those of other treatments. Fruit index was not affected by different combinations of training methods and soil management systems. Open head trained trees, grown in clean cultivated plots came next in this respect. Moreover, modified leader trained trees grown in mulched plots produced fruits better in their physical properties than those of modified leader trained trees grown in clean cultivated plots.

Generally, fruits of open head trained trees were more uniform heavier, longer, wider and contained less number of seeds as well as less firmness compared with those of modified leader trained trees.

On the other hand, rice straw mulch system improved all previously mentioned fruit physical properties than did clean cultivation system.

Experiment (2)

1,000 ppm "SADH"-sprayed trees gave fruits moderate in their size, lighter in their weight, early in maturity and contained the greatest number of seeds than those of the control and Gibberellin treatments. These fruits are longer and wider than those of the control.

On the other hand, "GA₃" treatments (10 & 20 ppm) gave the highest percentage of large size fruits, the heaviest fruits, the longest, widest and oblong fruits. Number of seeds per fruit was greatly reduced with raising up "GA₃" concentration. Fruit age to maturity did not affect by "GA₃" treatments (10 & 20 ppm).

Experiment (3)

"SADH" sprays (1,000 & 2,000 ppm) increased the percentage of uniform fruits which attained maturity earlier than the control. Moreover, "SADH" sprays decreased fruit weight, length, width and fruit index value, but increased fruit firmness. The positive effect of "SADH" treatments was more pronounced under open head training method than modified leader training method. Meanwhile, the depressive effect of "SADH" was more obvious in the opposite case of previously training methods. High "SADH" level seemed to induce more effect than low level. "CEPA" sprays (150 & 300 ppm) gave more depressive effect than "SADH" sprays. Moreover, "CEPA" sprays hastened fruit maturity and decreased fruit firmness than did "SADH" sprays. "CEPA" treatment took the same line of "SADH" not only under both training methods but also in term of concentration. Furthermore, "CEPA" sprays (300 ppm) exerted more depressive effect on fruit size, fruit weight, fruit length, width and fruit index than "SADH" sprays (2,000 ppm). Meanwhile, 2,000 ppm "SADH" sprays increased number of seeds per fruit more than 300 ppm "CEPA" sprays and the control. Moreover, "SADH" sprays increased fruit firmness, whereas "CEPA" sprays caused a decrease. In addition, fruits of "CEPA"-treated trees attained maturity earlier than those of "SADH"-sprayed ones. Low levels of "CEPA" and "SADH" took the same pattern of high levels.

6.2 Fruit chemical properties

Experiment (1)

Open head trained trees, managed by rice straw mulch showed the highest fruit total soluble solids least total fruit acidity and highest total soluble solids:acid ratio, followed by those trained as open head and grown in clean cultivated plots. Meanwhile, modified leader trained trees, managed by clean cultivation gave the least fruit total soluble solids, the highest total acidity and the least total soluble solids:acid ratio. Moreover, modified leader trained trees, grown in mulched plots, showed intermediate values in this respect.

On the other hand, open head improved fruit chemical properties, hence it increase fruit total soluble solids, decreased total fruit acidity and increased total soluble solids:acid ratio than did modified leader. As for soil management system, neither clean cultivation, nor mulch system affected fruit chemical properties.

Experiment (2)

"SADH" sprays (1,000 ppm) improved fruit chemical properties through increasing total soluble solids, reducing total fruit acidity and increasing the ratio between total soluble solids and total acidity than did unsprayed trees and "GA₃" treatments. Moreover, "GA₃" sprays (10 & 20 ppm) did not affect fruit chemical properties.

Experiment (3)

"CEPA" and "SADH" sprays, when applied to open head trained trees caused the highest increase in total soluble

solids, the least total fruit acidity and the highest total soluble solids:acid ratio than when applied to modified leader trained trees. "CEPA" sprays surpassed "SADH" treatments in this respect. On the other hand, "CEPA" sprays improved all concentrated fruit chemical properties than did "SADH" sprays. Growth regulator concentrations were not effective in this respect.