ΧΗΜΕΙΑ.—**The influence of the chemical composition of some organs of the olive tree on the fruiting of it***, *by* ***P. Th. Anagnostopoulos*** *and* ***Sp. Galanos***. Ἀνεκοινώθη ὑπὸ κ. Ι. Χ. Πολίτου.

The olive tree presents, as any tree, three conditions of growth, that is the vigorous, the moderate and the poor. From these conditions the

Fig. 1.—Twigs of wild tree at 14.6.32. A3 is of physiological moderate growth accompanied by sufficient elongation and satisfactory fruiting. A4 indicates pour growth and fruiting on account of ringed branch.

second one is that which interests the olive cultivators because it ensures fruitfulness whereas the latter two secure more or less unfruitfulness.

The above conditions have relation to the chemical composition of the organs (twigs, leaves) affecting the blooming, fertilization of the flowers and fruitfulness of the olive tree.

According to Davis, L. D. (1), who investigated alternate-bearing sugar prunes, «Starch is consistently higher in the non-bearing trees than in the bearing».

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Kraus, E. J. and Kraybill, H. R. (2), studied the special conditions of growth of the tomato.

Potter, G. F. and Phillips, T. G. (3), investigated into the composition and fruit-bud formation in non-bearing spurs of Baldwin apple.

Roberts, R. H. (4), was engaged diffusively with the «off-year apple bearing». The same 5, investigated further with «apple physiology (composition and fruiting responses in apple trees)». The same also 6, studied the «sour cherry fruiting».

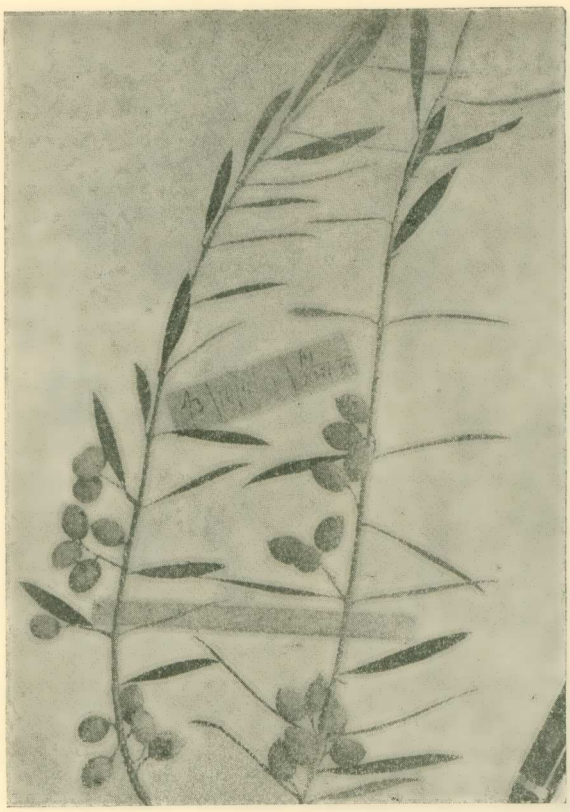

Fig. 2.—Growth of wild-olive tree at the date of 16. II. 31 (b). A3 is physiological twig formed in very good condition, warranting good fruiting next year; the growth of the twig A1 is defective, excluding fruiting next year, because the bearing it branch was ringed ad 28.2.31.

So, after Potter and Phillips (3), the constant element contained in the twigs, which is found in close relation with blossom formation, is the insoluble nitrogen. The accumulation of soluble carbohydrates, such as reducing sugars, depresses fruit-bud formation.

According to Roberts (5), «over-vegetative» trees having a high nitrogen and low carbohydrate content were unfruitful; also, «undervegetative» trees having a low nitrogen and high carbohydrate content were unfruitful; and blossom bud formation accompanied a condition of moderate growth where there was a relative analogy between the nitrogen and carbohydrate content. These findings agree with the conclusions of Kraus and Kraybill (2).

Davis (1), found that starch is constantly higher in the non-bearing than the hearing sugar prune trees.

Drived by the thought of studying extensively the very important for our (Greek) National Economy Olive tree and having in mind the above works, we proceeded with the attendance of the different phases of growth of the olive tree during the whole year and under all the condi-

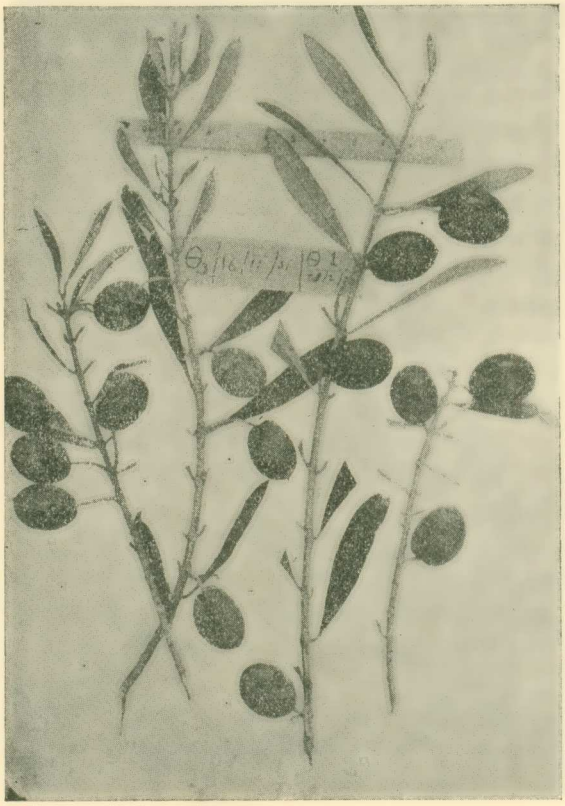

Fig. 3. — Growth of «Attic» variety of olive tree at 16. 11. 33 (b); the conditions of O3 and O1 are corresponding to the A3 and A1 of the fig. 2.

tions and with the analysis of twigs, leaves and fruits, in order to find out their composition and the relations of the different compounds amongst them and in comparison with the different conditions of growth.

To accomplish the above purpose, we attended trees of Wild olive and of the variety of «Attic», growing in the orchard of the Superior School of Agriculture Athens and in the Athens Street and especially, 1 of vigorous growth, Z and worthless fruiting, 2 of moderate growth, M and regular fruiting, 3 of poor growth and unfruitfulness, E resulting from

flower abscission on account of such growth and 4 of poor growth of some their ringed branches X.

Samples from the above trees were taken of one-year old twigs, from which the leaves and fruits were taken off, of 2-year old twigs and leaves of the above twigs. These were taken at the following dates: a. 17.7.31, b. 16.11.31, c. 4.4.32 and d. 17.7.32 and submitted to analysis in order to find out their composition to total sugars, starch and dextrins, and nitrogenous compounds.

The composition to the above three classes of compounds was tabulated in the following tables. The fourth table shows the composition of the fruits to oil.

TABLE I.

**The composition to total nitrogenous compounds of some olive tree tissue.**

| Tree Organs | Dates of Sampling | of «Attic» variety | | | | of Wild olive | |
|---|---|---|---|---|---|---|---|
| | | Series Z | Series X | Series M | Series E | Series X | Series M |
| 1-year old twigs | a | — | 4.98 | 5.35 | 5.80 | — | — |
| » | b | 7.09 | 5.54 | 4.43 | 3.87 | 4.09 | 4.44 |
| » | c | 5.60 | 3.40 | 4.50 | 3.44 | 3.44 | 5.38 |
| » | d | — | — | 6.01 | 5.35 | 6.81 | 7.01 |
| 2-year old twigs | a | 2.61 | 4.76 | 6.25 | 3.97 | — | — |
| » | b | 0.84 | 3.83 | 3.85 | 4.06 | 3.80 | 5.81 |
| » | c | 3.10 | 2.74 | 3.16 | 2.78 | 2.41 | 4.22 |
| » | d | 4.66 | — | 5.17 | 5.60 | 6.29 | 6.63 |
| Leaves | a | 13.30 | 12.89 | 15.45 | 13.83 | — | — |
| » | b | 14.20 | 12.26 | 12.22 | 11.88 | 11.03 | 10.64 |
| » | c | 11.46 | 9.20 | 9.01 | 15.50 | 6.34 | 7.50 |
| » | d | 1.72 | — | 11.00 | 11.04 | 1.85 | 10.42 |

From the above Table I is assembled that:

The one-year old twigs of the vigorous Z, and the moderate growth branches or trees contained the greater amounts of nitrogenous compounds, while the smallest ones were found into the ringed X, and the dropping their flowers E, branches or trees. Smaller amounts of the same compounds were found into the two-year old twigs of the «Attic» variety and in the ringed ones of the wild olive tree. Greater amounts were found in the leaves of the dropping the flowers «Attic» variety. Also in the leaves and twigs of moderate growth or ringed in all the trees.

It is generally assembled that the presence of satisfactory amount of nitrogenous compounds into the annual growth sets in order the regular fruitfulness.

TABLE II

**The composition to total sugars of some olive tree tissue.**

| Tree Organs | Dates of sampling | of «Attic» variety | | | | of Wild olive | |
|---|---|---|---|---|---|---|---|
| | | Series Z | Series X | Series M | Series E | Series X | Series M |
| 1-year old twigs | a | — | 0.54 | traces | 2.73 | — | — |
| » | b | traces | traces | 1.04 | 1.38 | 1.66 | 1.33 |
| » | c | 1.34 | 1.60 | traces | 0.54 | 0.70 | traces |
| » | d | traces | — | traces | traces | traces | traces |
| 2-year old twigs | a | 0.95 | traces | 0.68 | 0.50 | — | — |
| » | b | 0.47 | traces | traces | 1.10 | 0.95 | 1.63 |
| | c | 1.02 | traces | traces | traces | 0.92 | traces |
| » | d | traces | — | traces | traces | traces | traces |
| Leaves | a | 5.20 | traces | traces | 2.64 | — | - |
| » | b | traces | traces | traces | traces | traces | 1.20 |
| | c | traces | 1.53 | 0.40 | traces | 0.40 | 1.17 |
| | d | traces | — | traces | traces | traces | traces |

The above table II teaches that:

The dropping their flowers trees E, contain the largest amounts of sugars in the one-year old twigs; also the ringed twigs.

In the two-year old twigs the conditions are reversed, and the largest amounts are found in the vigorous Z, twigs.

On the leaves the amounts vary, but appear in the wild olive of moderate growth M, in greater generally proportions in relation to the other conditions and especially on all at the season b, and comparatively to the conditions X, of wild olive and M, of the «Attic» variety at the season c. It is therefore concluded that the presence of the sugars and especially in the season c, that is in spring, hinders the fruitfulness.

The table III shows that:

The starch and the dextrin appear in greater amounts in the one-year old twigs, borne on ringed branches, and especially (Attic variety) at the beginning of the summer a; also in the vigorous twigs of the same age.

The two-year old twigs of the «Attic» variety contained greater amounts when borne on vigorous branches Z, and on those of dropping its blossoms tree E, while this happened in ringed twigs of the wild olive tree.

The greater amount of starch and dextrin was observed at the beginning of the summer of the first year a, in the leaves of moderate growth twigs M, and of those

TABLE III

**The composition to starch & dextrin of some olive tissue.**

| Tree Organs | Dates of sampling | of «Attic» variety | | | | of wild olive | |
|---|---|---|---|---|---|---|---|
| | | Series Z | Series X | Series M | Series E | Series X | Series M |
| 1-year old twigs | a | — | 8.25 | 0.80 | traces | — | — |
| » | b | 1.00 | 0.44 | traces | 1.08 | 1.10 | 1.02 |
| » | c | 3.30 | 1.12 | 2.35 | 2.12 | 2.28 | traces |
| » | d | 1.54 | — | 2.05 | 1.24 | 1.62 | 1.61 |
| 2-year old twigs | a | 0.65 | traces | 0.45 | 0.45 | — | — |
| » | b | 0.83 | 0.53 | traces | 1.63 | 1.56 | traces |
| » | c | 1.93 | traces | 1.23 | 0.70 | 2.50 | traces |
| » | d | 1.01 | — | 0.91 | 1.68 | 1.28 | 0.93 |
| Leaves | a | 0.20 | 1.44 | 5.36 | 1.75 | — | — |
| » | b | 0.60 | 0.40 | 0.23 | 0.23 | 0.37 | 1.04 |
| » | c | 1.03 | traces | 1.25 | 0.61 | 1.33 | traces |
| » | d | 2.44 | — | 1.15 | 1.32 | 1.77 | 1.52 |

of dropping their flowers E, and ringed X, and smaller amounts in the leaves of vigorous twigs Z.

The presence of greater amounts of starch is, generally, a sign of tendency to unfruitfulness.

The conclusions drawn from the table IV are very interesting. The fruits borne on ringed branches X, contained more oil than those borne on analogous branches but growing physiologically M, that is without any interference with ringing.

From the above analyses, tabulated in the four tables, is concluded that:

1. The presence of enough nitrogenous matter, in connection with carbohydrates, helps the elongation and good maintaining of the vegetation and hinders the satisfactory fruitfulnes.

2. Moderate amount of nitrogenous matter, with respect to the above conditions, allows the formation of moderate vegetation and satisfactory fruitfulness.

TABLE IV

**The composition per cent to oil of the fruit of olive tree (estimated in the whole dry fruit)**

| Dates of sampling | of «Attic» variety | | of Wild olive | |
|---|---|---|---|---|
| | Series X | Series M | Series X | Series M |
| a | 4.94 | 4.45 | — | — |
| b | 42.05 | 40.15 | 37.16 | 36.79 |

3. Where carbohydrates predominate over the nitrogenous matter, the elongation of the vegetation is poor and the fruitfulness insignificant.

4. Where the conditions 3, were predominant, but after the fertilization of the flowers and formation of the fruits (ringed branches), the fruit contained more oil than where the physiological conditions 2, were prevailing.

These conclusions, strengthened by the accompanying three figures, agree with those of preceded investigators, as those mentioned in the bibliography, connected with fruitfulness and unfruitfulness of other trees.

The above conclusions must be considered as contribution to the explanation of the phenomenon related with the conditions of fruitfulness and unfruitfulness of the Olive tree.

## ΠΕΡΙΛΗΨΙΣ

Πρὸς τὸν σκοπὸν τῆς ἐξευρέσεως τῆς σχέσεως τῶν διαφόρων καταστάσεων βλαστήσεως τῆς ἐλαίας καθ' ὅλον τὸ ἔτος πρὸς τὴν χημικὴν σύστασιν ὀργάνων τινῶν αὐτῆς ἐγένετο ἡ παρακολούθησις ἐν τῷ Δενδροκομείῳ τῆς Ἀνωτάτης Γεωπονικῆς Σχολῆς Ἀθηνῶν καὶ ἀλλαχοῦ ὡρισμένων δένδρων φυομένων ὑπὸ διαφόρους καταστάσεις καὶ ὑπεβλήθησαν εἰς χημικὴν ἀνάλυσιν τὰ φύλλα καὶ οἱ βλαστοὶ αὐτῶν (μονοετεῖς καὶ διετεῖς). Τὰ ὑπὸ παρατήρησιν δένδρα ἦσαν: 1, ζωηρᾶς βλαστήσεως Ζ μὴ καρποφοροῦντα, 2, μετρίας βλαστήσεως Μ καρποφοροῦντα, 3, πενιχρᾶς βλαστήσεως Ε μὴ καρποφοροῦντα, λόγῳ ἀνθορροίας ἐν ὁδῷ Ἀθηνῶν καὶ 4, πενιχρᾶς βλαστήσεως Χ διὰ τεχνητῆς ἀφαιρέσεως δακτυλίου φλοιοῦ ἐκ τῶν βλαστῶν (χαρακώματος).

Ἐκ τῶν ἀνωτέρω δένδρων ἐλήφθησαν δείγματα βλαστῶν ἐτησίων, ἐξ ὧν ἀφῃρέθη τὸ φύλλωμα καὶ οἱ καρποί, βλαστῶν διετῶν, ὡς καὶ φύλλων τῶν ἄνω βλαστῶν, εἰς τέσσαρας διαφόρους ἐποχάς, ἤτοι τῇ 17/7/31, τῇ 16/11/31, τῇ 4/4/32 καὶ τῇ 17/7/32. Εἰς τὰ δείγματα αὐτὰ προσδιωρίσθησαν τὸ ὁλικὸν σάκχαρον, τὸ ἄμυλον καὶ αἱ δεξτρῖναι, ὡς καὶ αἱ συνολικαὶ ἀζωτοῦχοι ὕλαι. Ἐπίσης προσδιωρίσθη τὸ ποσὸν τοῦ ἐλαίου εἰς καρποὺς προερχομένους ἐκ χαρακωθέντων, ὡς καὶ ἐκ φυσιολογικῶς αὐξανομένων βλαστῶν.

Ἐκ τῶν ἀποτελεσμάτων τῆς χημικῆς ἀναλύσεως συνάγονται τὰ κάτωθι συμπεράσματα:

1. Ἡ παρουσία σημαντικῆς ποσότητος ἀζωτούχων ὑλῶν ἐντὸς τῶν βλαστῶν καὶ φύλλων ὑποβοηθεῖ τὴν ἀνάπτυξιν αὐτῶν καὶ παρεμποδίζει τὴν ἱκανοποιητικὴν καρποφορίαν.

2. Μετρία ποσότης ἀζωτούχων ὑλῶν συντελεῖ εἰς μετρίαν ἀνάπτυξιν τῶν βλαστῶν καὶ ἱκανοποιητικὴν καρποφορίαν.

3. Ἡ παρουσία μικρᾶς σχετικῶς ποσότητος ἀζωτούχων ὑλῶν καὶ μεγάλης σχετικῶς ποσότητος ὑδατανθράκων συντελεῖ εἰς μετρίαν ἀνάπτυξιν τῶν βλαστῶν καὶ μετριωτάτην καρποφορίαν.

4. Ἡ παρουσία πολλῶν ὑδατανθράκων εὐνοεῖ τὸν σχηματισμὸν ἐλαίου ἐντὸς τῶν καρπῶν.

Τὰ πορίσματα ταῦτα συμφωνοῦν πρὸς τὰ συμπεράσματα ἄλλων ἐρευνητῶν, ὡς τῶν ἀναφερομένων ἐν τῇ συνημμένῃ βιβλιογραφίᾳ, οἵτινες ἠσχολήθησαν μὲ τὴν καρποφορίαν καὶ ἀκαρπίαν ἄλλων δένδρων.

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## ΠΑΡΟΡΑΜΑΤΑ

Εἰς τὰς Πράξεις καὶ Ἀποφάσεις τῆς συνεδρίας τῆς 9 Μαρτίου (σ. 91 τῶν ***Πρακτικῶν***) παρελήφθη ἐκ παραδρομῆς τὸ ὄνομα τοῦ κ. ***Ἰωάννου Καλιτσουνάκι*** ὡς μέλους τῆς Ἐποπτικῆς Ἐπιτροπῆς τῆς συντασσομένης Γραμματικῆς.

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