καὶ ἐπίκτητοι ἰδιότητες κληρονομοῦνται καὶ δὴ τῇ μεσιτείᾳ *ὁρμονῶν*, ἐκκρινομένων ὑπ' αὐτῶν τῶν πεπηρωμένων ὀργάνων. Αἱ ὁρμόναι αὐταί, ὅταν εἶναι ἄφθονοι, ἐπιδροῦν ἐπὶ τὰ γεννητικὰ κύτταρα (ᾠάρια ἢ σπερματοζῳάρια) τοῦ πεπηρωμένου ζῴου, τροποποιοῦσαι τὴν σύνθεσιν τοῦ *βλαστοπλάσματος* αὐτῶν ('Ανατομικὴ 3η ἔκδ. τ. 1, σ. 43, τ. ἔ. τῆς μετὰ μεῖξιν ἐνδεχομένην γονιμοποίησιν καταβολῆς τοῦ ἐμβρύου)[1].

ΑΝΑΚΟΙΝΩΣΕΙΣ ΜΗ ΜΕΛΩΝ

ΧΗΜΕΙΑ ΤΡΟΦΙΜΩΝ. — **Inhibition of enzymatic phenomena of the rancidity in the Greek salted and pressed fish,** *by George C. Kelaïditis**. 'Ανεκοινώθη ὑπὸ τοῦ κ. Σπύρου Δοντᾶ.

The alterations, in taste and smell, which are brought about in the fat salted and pressed fish, without the intervention of harmful bacteria and fungus, show all the characteristic phenomena of rancidity of the insaturated fatty acids, which mainly are due to purely enzymatic reactions of the hydrolytic and oxidizing enzymes on the fish oils. The hydrolytic reaction is due to the *lipase*, which according to the experiments of R. Amon (1934—1940) is found in the liver - pangreas organs of the small fish and under favorable conditions causes the hydrolysis of glycerides of fish oils into fatty acids and glycerin.

The oxidizing enzymatic reaction is attributed to the *Lipoxidase* so called by André and Hou (1932) and which is found in the fat fish and especially in the fat flesh of the fish according to the special study of I. A. Banks (1937).

Lipoxidase causes oxidation in the insaturated fatty acids and phospholipoids, creating organic peroxides, which further on are decomposed into various aldehydic and cetonic compounds as well as gas, acids and other elements. These compounds give to the salted and pressed fish the altered taste and smell of rancidity.

The enzymatic reaction of lipoxidase is activated by the light and hel-

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[1] *Γ. Σκλαβοῦνος.* «Περὶ τοῦ πρώτου ἐμβρυϊκοῦ κυττάρου καὶ τῆς σχέσεως αὐτοῦ πρὸς τὰ τοῦ τετελειωμένου ὀργανισμοῦ κύτταρα». Λόγος ἐναρκτήριος εἰς τὴν διδασκαλίαν μου τοῦ μαθήματος τῆς 'Ανατομικῆς τῇ 11 Νοεμβρίου 1899 ἔνθα περιγράφονται αἱ παλαιότεραι δοξασίαι, ἰδίως τοῦ Weissmann.

* **ΓΕΩΡΓ. Κ. ΚΕΛΑΪΔΙΤΟΥ: 'Αναστολὴ τῶν ἐνζυμικῶν φαινομένων τοῦ ταγγισμοῦ εἰς ἑλληνικοὺς ἁλιπάστους ἰχθῦς.**

ped by the oxygen of the atmospheric air. It is favored by the presence of metallic oxides and fatty acids. Lipoxidase reacts automatically in the air upon the insaturated fish oils of the salted and pressed small fish and due to this fact, the enzymatic phenomena of oxidation are called «autoxidations» This is considered as the agent of oxygen which is added to the double bonds of the insaturated fatty acids according to the reaction:

$$\begin{matrix} R \\ I \\ HC \\ II \\ HC \\ I \\ R \end{matrix} + O_2 \quad \ldots\ldots\ldots + \text{Lipoxidase} = \begin{matrix} R \\ I \\ HC \\ I \\ HC \\ I \\ R \end{matrix}$$

The experiments of R. Summer, Strain and Sullman (1941 — 1943) on the reaction of the lipoxidase proved that the most insaturated is the fatty acid the greater is the enzymatic oxidation and formed the opinion that the insaturated fatty substrata, which very easily gets peroxidized must be of the following synthesis:

$$- CH = CH - CH_2 - CH = CH - (CH_2)\ 7 - COOH$$

Thus the esters of the category of linseed - oil acid are oxydized quicker and better than the esters of the oleic - acid.

The fresh fish of the Greek seas as the sardines and anchovies brought to be salt - processed contain the fish oils mostly in their flesh at the rate of 5 – 9 %, varying according to the season of fishing and the size of the fish.

The chemical synthesis of these fish oils is 25 % esters of glycerin together with the insaturated fatty acids of the category of $C_v H_{2v} - 1\ COOH$, and 75 % esters of glycerin together with the insaturated fatty acids which contain from 1 – 6 double bonds and characterize the great instability of the fish oils, as insaturated glycerides against the enzymatic reaction of lipoxidase.

Lipoxidase in the atmospheric air affects the insaturated glycerides of fish oils in the following priority order:

a) *Series* $C_v H_{2v} - 11\ COOH$ *of the insaturated acids with 6 doubls bonds* to which belong the fatty acids with 22 and 24 carbon atoms.

b) *Series* $C_v H_{2v} - 9\ COOH$ *of the Clupanodonic acid with 5 double bonds* to which belong the fatty acids with 22 carbon atoms.

c) *Series* C_vH_{2v}*-7 COOH of the Arachidonic acid with 4 double bonds* to which belong the fatty acids with 18,20 and 22 carbon atoms.

d) *Series* C_vH_{2v}*-5 COOH of the Linolenic acid with 3 double bonds to which belonggthe fatty acids with 18 carbon atoms.*

e) *Series* C_vH_{2v}*-3 COOH of the Linoleic acid with 2 double bonds to which belong the fatty acids with 19 carbon atoms.*

f) *Series* C_vH_{2v}*-1 COOH of the Oleic acid with 1 double bond to which belong the fatty acide with 16, 18, 20 and 22 carbon atoms.*

The content in insaturated glycerids in the flesh of small fish to be salt processed mostly includes insaturated acids with 18, 20 and 22 atoms of carbon which may be set in order according to the detailed dada given in the experiments of Lovern (1936) (Table I).

TABLE I.

Percentage of insaturated fatty acids included in the glycerides of the flesh of sardines and anchovies.

Kind of Fish	Total Amount of glycerides %	Amount of Insaturated Glycerides % Av.	Content of insaturated glycerides in insaturated fatty acids			
			C_{16}	C_{18}	C_{20}	C_{22}
Sardines	6,60	4,80	0,40	1,70	1,54	1,16
Anchovies	7,50	5,40	0,44	1,92	1,72	1,32

The speed of the enzymatic oxidation of fish oils is mainly due to their content in insaturated glycerides of a great number of double bonds and is very much influenced by the presense of two categories of additional compounds.

The first category includes a series of prooxidants which favour and help the enzymatic oxidation.

Ziels and Schmidt (r945) after special studies reached the conclution that the metals, lead, maganese (Mn), copper and iron are the most important prooxidants the reaction of which increases with the increase of temperature. They have concluded that these metals themselves, are inactive but are changed into active prooxidants when turned into metalic salts with the assumption that they bound in preferance the oxygen contained in lipoxidase to

affect the double bond of the insatarated glycerides and get oxidated themselves, taking the oxidizing activity of the lipoxidase.

Announcements made on the fats by professor Lundberg show that the antioxidants have been used in a great extent in the form of fatty - soluble compounds of different synthesis either single or in combination with various organic and inorganic compounds, considered as *Synergistics* because they increase the power of autioxidants in preventing rancidity. The synergistic compound according to Golumbic (1942), who studied on the *Mechanism of Synergism* of such compounds, reacts as the agent of hydrogen on the antioxidant affected by the oxygen.

Antioxidants are phenolic compounds and especially compounds of the o - parahydroxybenzene, which, in a very small rate, inhibits the reaction of lipoxidase for a consideaable period of time. Such compounds, having been used in a large scale to fats, are Tocopherol (vitamin E), lecithin, N, D, G, A, (b, γ, bi - methylo - a, d bis (3,4 – hydroxyphenol) butane) hydroquinone, gallate propyl and various non processed vegetaple oils as cottonseed - oil and sesame - oil. The above mentioned fatty - soluble compounds, have been used, in a small quantity, in fatty substances.

As a matter of fact, the rancidity in the Greek salted and pressed fish is not inhibited, by using fatty-soluble antioxidants, because, due to the pressure during the salt processing and the isolation from the atmospheric air, rancidity is not caused in the glycerides of the flesh of the fish, but in the fish - oils included in the brine. It is well known that the production of the brine is due to purely osmotic phenomena of the small fish under processing, which lasts during all the maturing period. Consequently, the oxidizing reaction of lipoxidase is actually occuring in the secreted fish-oil of the salted and pressed fish, strongly aided by the atmospheric air and the brine, due to the fact that the sodiumchloride activate the enzymatic reaction of lipoxidase.

The special way of salting the Greek small fish creates abondant brine, which separates the greatest amount of fish oil contained in the flesh of the fish. The oli grandually led away with the brine and fresh brine is added. Our observations on the way of that process proved that considerable amounts of the sweeped away fish oil either are stuck on the sides of the container or remain on the outside surface of the salted aud pressed fish where they get oxidated very easily by rhe lipoxidase.

Due to the above, we are aiming at the possibility of using watersoluble antioxidants and especially such as being easily disolved in the brine, so that they can entirely cover the molecules of fatty substance, protecting them from oxidation.

After the ammouncement of observations made by Grapple, Spannuth and Mc Guine (1946) who ascertained that the tannic acids are active antiovidant compounds, we have made many efforts to find water - soluble antioxidants from ihe tannic acids. As a result of many tests we have ended at the use of a dry extract from the bark of chestnut - trees, in *Synergism* with very small quantities of tartaric acid and hydroquinone.

The dry alcooholic extract of the chestnut - tree bark proved to be, according to experiments made, perfect antioxidant substance. It consist of 63 % of tannic acid compounds, anhydrites of poly-digallol and of leuco-digallic acid.

The non tannic acid part of the extract contains glycose ethyl - gallate, pectin and resinous compounds.

Table II, which is attached, shows the average of tests made, according to the above method, on salted and pressed sardines of Mytilini area.

On this table are shown the results of the slowing down rancidity by using, on the one hand, only dry extract of the chestnut - tree bark (D.E.C.) and on the other by adding to the dry extract of the *synergistic* substances as tartaric acid and hydroquinone. The use of dry extract (D.E.C.) of the chestnut - tree together wilh the *synergistic* compounds had been made after it had been disolved in recently prepared salted water in the following proportions :

a) Dry extract of the chestnut - tree Bark (D.E.C.) : 2 gr. per litre of brine.
b) (D.E.C.) : 2 gr. + 0,5 gr. tartaric acid per litre of brine.
c) (D.E.C.) : 2 gr. + 0,5 gr. tartaric acid + 0,2 gr. hydroquinone per litre of brine.

The experimental results which are evident in the graph, prove that the existence of (D.E.C.) only, considerably inhibits the reaction of lipoxidase on the insaturated glycerides which are sweeped put by the brine during the maturing period.

By adding, on the other hand the synergistic compounds of tartaric acid and hydroquinone, the activity of the tannin containing extract in the inhibition of enzymatic oxidation is considerably increased.

Parallely to the above, we have proceded to comparative tests using dry

extract from the oak tree bark but results were not satisfactory.

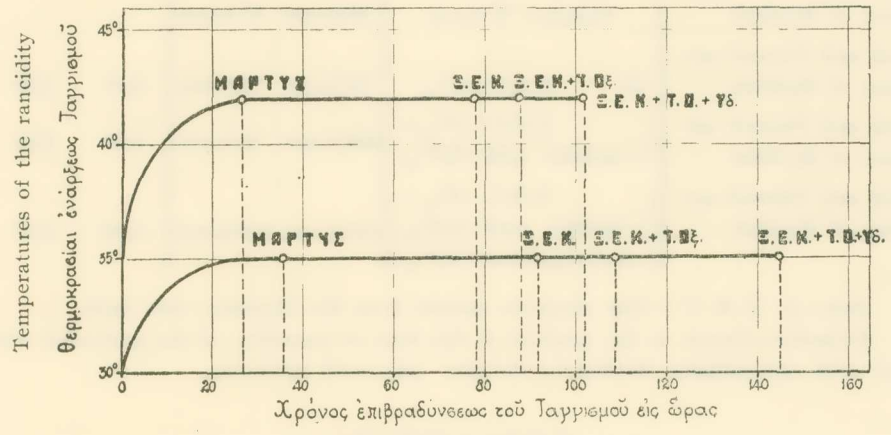
The active power of hydroquinone as synergistic substance of the extract (D.E.C.) containing tannin is due to its phenolic substance $C_6H_4(OH)_2$, which is very antioxidant

The use of pure hydroquinone only as subsance inhibiting rancidity gave satisfactory results but its use in a heavier solution should not be permitted due to its poisonous qualities. This has been clearly defined in the biological studies of Woodward, Hagen and Radowskic (1949).

Conclusions: The above experimental data which have been comparatively checked according to the method of Schaal, by various tests and several determinations of the formation of peroxides, constitute clear indications of the inhibiting results that lipoxidase's oxidazing reaction has on the fish oils covering the surface of the salted and pressed fish.

The peculiar method of sald processing the small fish which is applied here, is not favorable to the use of fatty-soluble autioxidants because they are not easilymixed with the fish oils in the brine. On the contrary, it favors the use of soluble (D.E.C) which is based on the exceptional qualities of the water-soluble compounds of pyrogallol contained in it.

Πίναξ I. Γραφικὴ παράστασις. (Graph of Table N° 1).



ΜΑΡΤΥΣ = Witness.
Ξ. Ε. Κ. = Chestnut-tree bark extract.
Τ. Οξ. = Tartaric acid.
Υδ. = Hydroquinone.

The antioxidating power of these compounds, either alone or together with synergistic substances, is apparent from the increased period of time which is required for the rancidity phenomena to start.

The inhibiting power of the (D.E.C.) with the synergistic compounds can easily be explained by the fact that it is easily disolved in brine and complettely covers the fatty molecules. Probably a part of it, is entirely mixed with the fatty molecules so that it can get, in preferance, the enzymatic influence of oxidation and serve as inhibiting obstacle against the transferred atmospheric oxygen, by lipoxidase, to the easily affected double bonds of insaturated glycerides.

TABLE II.

Comparatives tests inhibiting rancidity in the fat salted and pressed small fish according to the method of Schaal of electric kiln - Use of a tannin containing water soluble antioxidant together with synergistic substances.

Tested kind of fish	Proportion of Antioxidants in brine gr. per litre	Period of time before the phenomena of rancidity start — Test with electr. kiln according to Schall		Protective Factor	
		35°C	42°C	In temperature 35°C	In temperature 42°C
Salted and Pressed sardines of Mytilini	Sample - Witness	36 hours	27 hours	—	—
Salted and Pressed sardines of Mytilini	(1) D.E.C. = 2^0_{00}	92 hours	78 hours	2,05	2,88
Salted and Pressed sardines of Mytilini	D.E.C. = 2^0_{00} + + tartaric acid = $0,5^0_{00}$	109 hours	88 hours	3,02	3,25
Salted and Pressed serdines of Mytilini	D.E.C. = 2^0_{00} + + tartaric acid = $0,5^0_{00}$ + hydroquinone = $0,2^0_{00}$	145 hours	102 hours	3,10	3,77

Note: (1) D. E. C. = Dry alcoholic extract from the Chestnut - tree bark.

Protective Factor is the quotient of the time of rancidity of the processed substance with antioxidants, divided by the non - processed substance.

ΠΕΡΙΛΗΨΙΣ

Αἱ ἀλλοιώσεις τῆς γεύσεως καὶ τῆς ὀσμῆς, αἱ ὁποῖαι προκαλοῦνται εἰς τοὺς παχεῖς ἁλιπάστους ἰχθῦς (ἄνευ τῆς παρεμβάσεως τῶν ἐπιβλαβῶν βακτηρίων καὶ μυκήτων) παρουσιάζουν ὅλα τὰ χαρακτηριστικὰ φαινόμενα τοῦ ταγγισμοῦ τῶν

ἀκορέστων λιπαρῶν ἑνώσεων, τὰ ὁποῖα κατὰ τὸ μέγιστον αὐτῶν μέρος ὀφείλονται εἰς καθαρῶς ἐνζυμικὰς δράσεις τῶν ὑδρολυτικῶν καὶ ὀξειδωτικῶν ἐνζύμων ἐπὶ τῶν ἰχθυελαίων.

Προκειμένου περὶ τῶν ζωϊκῶν λιπαρῶν οὐσιῶν εὐρύτατα ἔχουσι χρησιμοποιηθῇ λιποδιαλυταὶ ἀντοξειδωτικαὶ οὐσίαι μὲ λίαν ἱκανοποιητικὰ ἀποτελέσματα ἀναστολῆς τοῦ ταγγισμοῦ.

Εἰς τὴν περίπτωσιν ὅμως τῆς ἀναστολῆς τοῦ ταγγισμοῦ εἰς τὰ παχέα ἑλληνικὰ ἁλίπαστα καθίσταται δύσκολος ἡ χρησιμοποίησις λιποδιαλυτῶν εὐοξειδώτων οὐσιῶν, διότι, εἰς αὐτά, λόγῳ τῆς πιέσεως κατὰ τὴν ἅλισιν καὶ τῆς ἀπομονώσεως αὐτῶν ἐκ τοῦ ἀτμοσφαιρικοῦ ἀέρος, ὁ ταγγισμὸς δὲν προκαλεῖται εἰς τὰ γλυκερίδια τῆς σαρκὸς τῶν ἰχθύων, ἀλλὰ εἰς τὰ παρασυρόμενα ὑπὸ τῆς ἅλμης ἰχθυέλαια.

Αἱ πολλαπλαῖ ἐρευνητικαὶ ἡμῶν προσπάθειαι ἀπέδειξαν τὴν δυνατότητα χρήσεως ὑδροδιαλυτικῶν εὐοξειδώτων οὐσιῶν τοιούτων, ὥστε νὰ διαλύωνται εὐκόλως ἐντὸς τῆς ἅλμης. Αἱ οὐσίαι αὗται περιβάλλουν ἐξ ὁλοκλήρου τὰ μόρια τῶν ἰχθυελαίων, τὰ ὁποῖα προφυλάσσονται οὕτως ἀπὸ τὴν ὀξείδωσιν (ταγγισμόν).

Κατόπιν πολλῶν δοκιμῶν καὶ τῶν γενομένων ὑφ' ἡμῶν παρατηρήσεων κατελήξαμεν εἰς τὴν χρησιμοποίησιν τοῦ ξηροῦ οἰνοπνευματικοῦ ἐκχυλίσματος τοῦ φλοιοῦ καστανέας (Ξ. Ε. Κ.) τῇ συνεργίᾳ μετ' ἐλαχίστων ποσοτήτων τρυγικοῦ ὀξέος καὶ ὑδροκινόνης.

Τὰ πειράματα ἐξετελέσθησαν εἰς δύο σειρὰς ἐπὶ δειγμάτων ἁλιπάστων παχειῶν σαρδελλῶν τῆς περιοχῆς τῆς νήσου Μυτιλήνης, εὑρισκομένων εἰς τὸ στάδιον τῆς ὡριμάσεως καὶ μὲ περιεκτικότητα λιπαρῶν οὐσιῶν εἰς τὴν σάρκα ἴσην πρὸς 5,60 %. Συνεπληρώθησαν δ' αἱ ἔρευναι εἰς τὰ ἐν Πειραιεῖ Ἐργαστήρια τοῦ Ὑδροβιολογικοῦ Ἰνστιτούτου διὰ τῶν ἐσχάτως παραληφθέντων ἐπιστημονικῶν ὀργάνων.

Ἡ πρώτη σειρὰ τῶν δοκιμῶν ἐγένετο ὑπὸ τοὺς κάτωθι ὅρους: Τέσσαρα ὅμοια δείγματα τῶν σαρδελλῶν, ἀφοῦ ἀπηλλάγησαν ἀπὸ τὸ ἅλας τῆς προσμείξεως, ἐνεβαπτίσθησαν ἀνὰ ἓν συγχρόνως ἐπὶ χρονικὸν διάστημα δέκα δευτερολέπτων εἰς τέσσαρα χωριστὰ λουτρὰ ἐκ τῆς ἰδίας κεκορεσμένης καθαρᾶς ἅλμης.

Καὶ τὸ μὲν πρῶτον λουτρὸν περιεῖχε μόνην τὴν καθαρὰν ἅλμην, ὥστε τὸ ἐντὸς αὐτῆς δεῖγμα σαρδέλλας νὰ χρησιμεύσῃ ὡς μάρτυς.

Εἰς τὸ δεύτερον λουτρὸν περιέχον τὴν αὐτὴν ἅλμην προσετέθη ξηρὸν ἐκχύλισμα φλοιοῦ καστανέας εἰς ἀναλογίαν δύο γραμμαρίων κατὰ λίτρον.

Εἰς τὸ τρίτον λουτρὸν ἐκτὸς τῆς ἅλμης καὶ τοῦ ἐκχυλίσματος προσετέθη τρυγικὸν ὀξὺ εἰς ἀναλογίαν 0,5 γρ. κατὰ λίτρον.

Καὶ εἰς τὸ τέταρτον λουτρόν, ἐκτὸς τῶν ἀνωτέρω δύο οὐσιῶν, προσετέθη καὶ ὑδροκινόνη εἰς ἀναλογίαν 0,2 γραμμ. κατὰ λίτρον. Μετὰ ταῦτα τὰ 4 δείγματα σαρδελλῶν ἐτοποθετήθησαν ἐντὸς ἠλεκτρικοῦ ξηροκλιβάνου, φυσικῶς ἀεριζομένου, τοῦ ὁποίου ἡ θερμοκρασία ἐρρυθμίσθη εἰς τοὺς 35 βαθμοὺς Κελσίου καθ' ὅλην τὴν διάρκειαν τοῦ πειράματος.

Οὕτω τὰ δείγματα εὑρίσκοντο ὑπὸ λίαν δυσμενεῖς συνθήκας διατηρήσεως, ἤτοι εἰς συνεχῶς ἀεριζόμενον περιβάλλον καὶ εἰς ὑψηλὴν θερμοκρασίαν 35 βαθμῶν Κ., ἐνῷ αἱ σαρδέλλαι ὑπὸ τὰς συνήθεις συνθήκας εὑρισκόμεναι ἐντὸς τοῦ δοχείου οὐδεμίαν ἐπαφὴν ἔχουν μετὰ τοῦ ἀέρος, λόγῳ τῆς συμπιέσεως, ἡ δὲ θερμοκρασία αὐτῶν δὲν ὑπερβαίνει συνήθως τοὺς 18 βαθμοὺς Κελσίου.

Ἡ παρακολούθησις ἐνάρξεως τοῦ ταγγισμοῦ ἐγίνετο διὰ λήψεως ἐκ τοῦ κλιβάνου ἀνὰ ἐννεάωρον δειγμάτων πρὸς ἔλεγχον τῆς γεύσεως καὶ τῆς ὀσμῆς καὶ πρὸς προσδιορισμὸν τῶν σχηματιζομένων ἐκ τοῦ ταγγισμοῦ ὑπεροξειδίων.

Ἡ δευτέρα σειρὰ τῶν δοκιμῶν ἐγένετο ὑπὸ τοὺς αὐτοὺς ἀκριβῶς ὅρους μὲ μόνην διαφορὰν ὅτι ἡ θερμοκρασία ἐρρυθμίσθη ὑψηλοτέρα κατὰ 7 βαθμούς, ἤτοι εἰς 42 βαθμοὺς Κελσίου.

Τὰ ἀποτελέσματα τῶν πειραμάτων τούτων παρουσιάζονται παραστατικῶς εἰς τὰς δύο καμπύλας τοῦ πίνακος. Ἡ κάτω καμπύλη ἐσχηματίσθη ἐκ τῶν δεδομένων τῆς πρώτης σειρᾶς τῶν πειραμάτων ὑπὸ θερμ. 35° Κ.

Τὸ δεῖγμα τοῦ μάρτυρος ἔδειξεν ἔναρξιν τοῦ ταγγισμοῦ μετὰ 36 ὥρας.

Τὸ τοῦ δευτέρου λουτροῦ μὲ τὸ ἐκχύλισμα τῆς καστανέας ἔδειξεν ἔναρξιν τοῦ ταγγισμοῦ μετὰ 92 ὥρας.

Τὸ τρίτον μὲ τὸ ἐκχύλισμα καὶ τὸ τρυγικὸν ὀξὺ μετὰ 109 ὥρας.

Τὸ δὲ τέταρτον, εἰς τὸ ὁποῖον εἶχε προστεθῆ καὶ ἡ ὑδροκινόνη μετὰ 145 ὥρας.

Οὕτως ἐν τῇ θερμοκρασίᾳ τῶν 35 βαθμῶν τὴν μεγίστην ἀντοχὴν εἰς τὸν ταγγισμὸν ἔδειξε τὸ ἐντὸς τοῦ μείγματος τοῦ ξηροῦ ἐκχυλίσματος καστανέας μετὰ τῶν συνεργῶν οὐσιῶν, τρυγικοῦ ὀξέος καὶ ὑδροκινόνης δεῖγμα.

Τὰ ἀποτελέσματα τῆς δευτέρας σειρᾶς ἔχουν ὡς ἑξῆς: Ὁ ταγγισμὸς τῶν ὑπὸ δυσμενεστέρους ὅρους, ἤτοι τὴν ὑπὸ ὑψηλοτέραν θερμοκρασίαν τεθέντων δειγμάτων σαρδελλῶν, ἤρχισεν:

Εἰς τὸ δεύτερον μετὰ 78 ὥρας.
Εἰς τὸ τρίτον μετὰ 88 ὥρας καὶ
Εἰς τὸ τέταρτον μετὰ 102 ὥρας.

Τοῦτο δεικνύει ὅτι ἡ ὑψηλοτέρα θερμοκρασία ἐπιφέρει πολὺ ταχύτερον ταγγισμόν.

Μετὰ τὰς πρώτας ταύτας παρατηρήσεις θὰ ἐξακολουθήσουν πειράματα εἰς ταπεινοτέρας θερμοκρασίας καί θὰ καταβληθῇ προσπάθεια πρὸς ἐξεύρεσιν τρόπου τῆς ἐπ' ἀόριστον ἀποφυγῆς τοῦ ταγγισμοῦ εἰς τὰ ἐκτὸς ψυγείου παραμένοντα ἑλληνικὰ ἁλίπαστα. Ἡ ἰδιότης τῆς ἐπιβραδυντικῆς ἱκανότητος τοῦ Ξ.Ε.Κ. μετὰ τῶν συνεργῶν ἑνώσεων δύναται νὰ ἐπεξηγηθῇ ἐκ τοῦ γεγονότος ὅτι εὐκόλως διαλύεται ἐν τῇ ἅλμῃ καὶ περιβάλλει πλήρως τὰ λιπαρὰ μόρια. Πιθανῶς δὲ μέρος αὐτοῦ νὰ προσμείγνυται στενῶς μετὰ τῶν λιπαρῶν μορίων οὕτως, ὥστε νὰ δέχεται, κατὰ προτίμησιν, τὴν ἐνζυμικὴν προσβολὴν τῆς ὀξειδώσεως καὶ νὰ χρησιμεύῃ ὡς ἀνασταλτικὸν προπέτασμα κατὰ τοῦ μεταφερομένου ὑπὸ τῆς λιποξειδάσης ἀτμοσφαιρικοῦ ὀξυγόνου εἰς τοὺς εὐπαθεῖς διπλοῦς δεσμοὺς τῶν ἀκορέστων γλυκεριδίων.

Οἱ ἁλίπαστοι ἰχθῦς εἶναι ἐκ τῶν πλέον θρεπτικῶν, ἀλλὰ καὶ εὐθηνῶν τροφίμων, περιέχοντες πολύτιμα θρεπτικὰ συστατικὰ εἰς μικρὸν ὄγκον καὶ εὐκόλως μεταφερόμενοι. Πρέπει ὅμως τὸ ἁλάτισμα νὰ γίνεται ἐπιμελῶς κατὰ τὰς ὑποδείξεις τῆς ἐπιστήμης, ὥστε τὰ ἁλίπαστα καὶ νὰ διατηροῦνται καλῶς μὴ βλάπτοντα τὴν ὑγείαν, ἀλλὰ καὶ νὰ ἔχουν καλὴν ὀσμὴν καὶ γεῦσιν διὰ νὰ τρώγωνται εὐχαρίστως.

Εἰς τοιαύτην δὲ καλὴν κατάστασιν πρέπει νὰ φθάνουν μέχρι καὶ τῶν μικροτέρων πόλεων τοῦ ἐσωτερικοῦ τῆς Χώρας.