

λήψις δὲν καθίσταται ἀδύνατος, ἀλλ' ἀπλῶς λίαν δυσχερής. Οἱ σταθμοὶ συνειργάζοντο, ἀλλὰ μετὰ δυσκολίας.

Τὴν 5 ὥρ. καὶ 24 λ. τῆς 30<sup>ης</sup>-3-40 ἐπανεμφανίζεται ἡ δυσχέρεια κατὰ τὴν συνεργασίαν μεταξὺ Λαρίσης-Σέδες καὶ Σέδες-Ἀθηνῶν.

Περὶ τὴν 11<sup>ην</sup> ὥραν ἡ λήψις ἀποβαίνει ἐντελῶς ἀδύνατος μέχρι τοῦ σημείου νὰ διαταχθῇ ἡ ἐγκατάλειψις τοῦ δικτύου βραχέων καὶ ἡ συνεργασία διὰ τοῦ δικτύου μακρῶν κυμάτων.

Διὰ τοῦ τελευταίου τούτου δικτύου ἡ σύνδεσις ἀποβαίνει ἐφικτὴ ἂν καὶ οὐχὶ ὀμαλή. Τέλος περὶ τὴν 13<sup>ην</sup> καὶ 30 λ. αἱ δυσχέρειαι αἴρονται. Ἐκτοτε δὲν ἀναφέρονται πλέον δυσχέρειαι τοιαύτης μορφῆς.

Ἐκ τῶν ἀνωτέρω προκύπτει, ὅτι τὸ ἐκ τῆς Ἑλλάδος παρατηρηθὲν βόρειον σέλας, προσκάλεσεν ἀσυνήθεις καὶ ἐντόνους ἀνωμαλίας διαδόσεως τοῦ κύματος χώρου, αἱ ὁποῖαι ἐφθάσαν καὶ μέχρι πλήρους διακοπῆς τῆς συνδέσεως, ἀκόμη καὶ δι' ἀποστάσεις 200 μόλις χιλιομέτρων, ὡς ἡ ἀπόστασις Ἀθηνῶν-Λαρίσης.

Κατὰ τὴν αὐτὴν περίοδον καὶ ἡ λήψις τῶν εὐρωπαϊκῶν σταθμῶν ἀπέβη λίαν δυσχερής, ἐνίοτε δὲ καὶ ἀδύνατος. Ἐκ τῶν ἐντὸς τῆς Ἑλλάδος ἀποτελεσμάτων, συγκρινομένων πρὸς τὰ τῆς λήψεως τῶν εὐρωπαϊκῶν σταθμῶν, συνάγεται ὅτι ἡ ἐμφάνισις τοῦ βόρειου σέλαος προσκάλεσεν ἀσυνήθη καὶ ἐντονὸν ἰοντισμὸν φθάσαντα βαθέως ἐντὸς τῆς ἀτμοσφαιρας καὶ ὑποβιβάσαντα ὡς ἐκ τούτου τὰς συνήθεις διὰ τὴν ἀνωτάτην ἀτμόσφαιραν ἐμβελείας τοῦ κύματος χώρου εἰς τὸ ἐλάχιστον.

#### ΓΕΩΡΓΙΚΗ ΤΕΧΝΟΛΟΓΙΑ.— **Freezing experiments on vegetables\***, —

A new freezing medium for quick freezing vegetables, *by* **Socrates A. Kalogreas**. Ἀνεκoinώθη ὑπὸ τοῦ κ. Κ. Βέη.

The purpose of the experiment was to develop a method of freezing for those vegetables like peas, cauliflower, spinach, etc. for which the slow freezing proved to not be so efficient especially when followed by storage in higher temperature and quick freezing in brine in the other hand tends to give to the product objectionable flavor (salty taste).

The first experiment was carried out for the purpose of studying the best procedure of quick freezing in brine: the time necessary for blanching as well as for freezing, the effect of dip in pectine solution before freezing, also the effect of precooling in an ice-cold water before dipping in the

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freezing liquid and the effect of rinsing with ice cold water after freezing.

Experiment with blanching for 2 and 4 minutes resulted in no appreciable difference in taste between the two samples. -Two minutes blanching in boiling water (the time measured from the moment the liquid boils) proved satisfactory in preventing discoloration (the cauliflower were cut in small pieces according the usual commercial practice).

Experimentss with freezing for 3,5 and 7 minutes in  $-20^{\circ}\text{C}$  in brine 22% salt resulted to show that 3 minutes freezing was not sufficient in the actual temperature of brine which fell from  $20^{\circ}$  to  $-16^{\circ}\text{C}$  and sometimes to  $-14^{\circ}\text{C}$ , during the dipping of the product; 5 minutes freezing under these conditions was needed for the freezing of cauliflowers.

Precooling in ice water and rinsing with ice water after freezing had beneficial effect upon the taste of the product which tasted less salty after cooking.

The product in all the above cases tasted nevertheless salty and other methods of improvement were tried.

The above experiments were repeated with brine of 15% salt (freezing point  $-10$ ) but gave still less satisfactory results than freezing in  $-20^{\circ}\text{C}$  brine.

*Other freezing solutions.* — In order to avoid the salty taste of the product we have tried to freeze cauliflowers in a mixture at 8% salt and 11% glycerine or 5% salt 10% glycerine and 12% sugar (both solutions have freezing point about  $-10^{\circ}\text{C}$ ).

The time of blanching was 4 minutes and of freezing 7 minutes, the temperature of the mixture was  $-9,5$  in the beginning and  $-8,5$  during the dipping operations.

The result of the first of these mixtures proved better than those we had before as the salty taste is concerned; the product dipped in the second mixture tasted rather sweet; both solutions were rather to viscous, especially the last one.

*Dipping in pectin solutions before freezing.* — The pectin used was a commercial kind of pectin preparation under the trade name «Certo», it had about 4% pectin but it was diluted to 1% and in this dilution the cauliflowers were dipped after blanching for two minutes before to be frozen in  $-20\text{C}$  and  $-10^{\circ}\text{C}$  brine, the freezing lasted 4 minutes.

The product was slightly salty in taste and better as compared with undipped samples, but the colour has changed a little to yellow (fact which

was due probably to the acidity or the colour of the pectin solution) and the time necessary for the cooking was increased.

*Experiments with alcohol.*—Two solutions, one of 21% alcohol and another 10% alcohol and 9% salt both having freezing point,  $-12^{\circ}\text{C}$  about were used.

The experiment consisted in freezing the cauliflowers in these two mixtures for 4 minutes after 2 minutes blanching with and with out dipping them in pectin solution.

The results were satisfactory; no one of the samples tasted alcohol or salt after cooking, only those samples dipped in pectin were harder and more yellow.

*Alcohol mixtures of lower freezing point.*—Solutions of 34% alcohol in water by volume or 29% alcohol and 8% salt of a freezing point about  $-20^{\circ}$  were tried as freezing agent, as well as alcohol 96% (freezing temperature about  $-60^{\circ}\text{C}$ ) under the previous conditions of blanching and freezing time.

The results were very good, by freezing in lower temperatures we had also quicker freezing.

*Rate of freezing in air.*—By putting several samples in  $1\frac{1}{2}$  flat cans and examining them at different intervals the rate of freezing in air of cauliflowers was examined in  $-20^{\circ}\text{C}$  and in  $-60^{\circ}$ . In the first case the time necessary to freeze was 7 to 10 hours while in the second case, only 60 minutes.

COMPARISON OF THE QUICK FREEZING IN ALCOHOL WITH SLOW FREEZING IN AIR  
AT VARIOUS TEMPERATURES

Comparison of freezing in alcohol solutions (at temperatures  $-20^{\circ}\text{C}$ ,  $-40^{\circ}\text{C}$  and  $-60^{\circ}\text{C}$ ) and storing in  $-20^{\circ}\text{C}$  with air freezing (in  $-5^{\circ}\text{C}$ ,  $-10^{\circ}\text{C}$  and  $-20^{\circ}\text{C}$ ) and storing in  $-5^{\circ}\text{C}$  and in  $-20^{\circ}\text{C}$  was made for the purpose to find out 1) the effect of method of freezing during the subsequent preservation 2) the effect of blanching 3) the loss of solids during cooking under standard conditions.

The experiments were conducted with two varieties of cauliflowers (with English cauliflowers in November 1938 and with Italian cauliflowers in February 1939) the samples were uniform of 100 gr. each, those blanched were put in 500 c.c. boiling water for 3 minutes.

The samples were cut in small pieces, as ordinarily do commercially, and put in  $1\frac{1}{2}$  flat cans, but also whole cauliflowers were frozen in order

to see, whether they could be kept by simple wrapping them in papers. Similar experiments were conducted with spinach. The standard cooking consisted in heating the sample in an electrical hot plate of 800 watt for 18 minutes (actual boiling), in the case of cauliflowers with 200 c.c. of water and for 10 minutes with 100 c.c. of water in the case of spinach. The results appear in the following tables I and II.

#### SUMMARY AND RESULTS

Several methods of freezing cauliflowers and spinach were tried in a preliminary way, the best results secured by quick freezing in alcohol and by air at low temperatures; these two methods were more carefully examined and compared. Blanching before freezing is quite necessary for the preservation of cauliflowers although it does not seem to be needed to the same extent for the preservation of spinach. Freezing in alcohol needs less blanching than freezing in air. After blanching the wt of samples was increased to 11 % by absorption of water, but a large amount of solids (25 % about) was dissolved in to the blanching water (1,23 % of the wt of cauliflowers and 0,7 % of the wt of spinach).

The solids dissolved in the cooking liquor amount to 35 % of the remained solids after blanching in cauliflowers and to 25-35 % in spinach. The method of freezing and thawing has no definite effect upon the amount of solids dissolved in the cooking liquor.

Blanching has a tendency to give more drip during Thawing.

The above experiment were conducted in the «low temperature Institut» of Cambridge (England) at the laboratories of Dr Barker and Mr Morris to which I am very grateful for their helpful collaboration.

#### ΠΕΡΙΛΗΨΙΣ

Εἶναι γνωστὸν ὅτι οὔτε ἡ βραδεῖα κατάψυξις εἰς τὸν ἀέρα οὔτε ἡ ταχεῖα τοιαύτη ἐντὸς ἄλμης ἢ διαλύματος σακχάρου ἔδωσαν μέχρι τοῦδε ἱκανοποιητικὰ ἀποτελέσματα εἰς τὴν κατάψυξιν (Freezing) ὠρισμένων λαχανικῶν καὶ φρούτων καὶ συγκεκριμένως εἰς τὰ κουνουπίδια, τὰ σπανάκια, τὶς φράουλες κτλ. Πρὸς τὸν σκοπὸν, ὅπως εὐρωμεν ἐπιτυχῆ τρόπον καταψύξεως τῶν τοιούτων προϊόντων ἐνηργήσαμεν συστηματικὰ πειράματα τόσον εἰς τὸ ἐν Cambridge Ἰνστιτούτον ψύχους τῆς Ἀγγλίας, ὅσον καὶ εἰς τὸν ὑφ' ἡμᾶς Σταθμὸν Ἑρεῦνης Γεωργικῆς Τεχνολογίας τοῦ Ὑπουργείου Γεωργίας, χρησιμοποιοῦσαντες ἄλλοτε μὲν ἐμβαπτίσεις εἰς διάλυμα πηκτικῶν οὐσιῶν πρὸ τῆς καταψύξεως, ἄλλοτε δὲ διαλύματα οἰνοπνεύματος ἀμιγῆ καὶ ἐν ἀναμείξει μετὰ σάκχαρον, ἄλλας καὶ γλυκερίνην.

TABLE I.

Showing the loss of solids in cauliflowers during blanching cooking and storage by the different methods of freezing

N <sup>o</sup>	Samples	c. c. of cooking liquor	Wt of sample after cooking	Solids in cooking liquor	Solids extracted from cooked sample	Total solids	Time of storage
<b>A. ITALIAN CAULIFLOWERS</b>							
1	Not blanched not frozen	43	103,2	1,332	3,056	4,644	
<b>Frozen in air and not blanched</b>							
2	Frozen at -20°C thawed in room 15°C	64	98,5	1,698	3,056	4,754	
3	The same as the above but thawed in hot water	74	101	1,530	2,976	4,506	
4	The same as above but thawed in room +1°C	42	101	1,616	2,776	4,392	
5	Frozen at -5°C stored at -5°C	20	100,5	1,054	3,740	4,794	
<b>Frozen in alcohol blanched</b>							
6	Frozen at -20°C stored at -20°C	60	106	1,370	2,034	3,404	
7	Frozen at -40°C stored at -20°C	94	104,5	1,523	2,268	3,791	
8	Frozen at -60°C stored at -20°C	94	103	1,520	2,280	3,800	
9	Frozen at -60°C stored at -20°C	37	97	0,980	2,660	3,640	
<b>Frozen in alcohol dipped in pectin solution</b>							
10	Frozen at -40°C stored at -20°C	56	105	1,734	2,734	4,460	
11	Frozen at -60°C stored at -20°C	—	107	1,572	2,812	4,384	
<b>B. ENGLISH CAULIFLOWERS FROZEN IN</b>							
12	Frozen at -20°C blanched stored at -20°C	62	86	1,094	1,227	2,321	
13	Frozen at -45°C blanched stored at -20°C with dry ice	95	90,8	1,160	1,952	3,112	
14	Frozen at -45°C not blanched stored at -20°C	42	97	1,480	1,471	2,951	
<b>Frozen in alcohol</b>							
15	Frozen at -60°C blanched stored at -20°C	85	100	0,994	1,696	2,690	
16	Frozen at -20°C and -60°C successively rinsed and precooled	47	91	0,870	1,823	2,693	
17	Frozen at -20°C and -60°C successively rinsed and precooled	66	82,5	1,020	1,560	2,556	
	Average 1 to 5 .. .. .					4,62	
	Average 6 — 9 .. .. .				2,31	3,66	
	Loss in blanching (direct measurement) % .. .. .					1,23	
	Loss in blanching (from difference) .. .. .			4,62—3,66 = 0,96		} 2,31	
	Further loss in cooking of frozen cauliflowers .. .. .			3,66—2,31 = 1,35			
	Total loss .. .. .					2,31 (about 5	
	Loss in cooking with out freezing .. .. .					1,33 (about 2	



TABLE II.  
*Showing the loss of solids in spinach during blanching cooking and Storage by the various methods of freezing.*

N <sup>o</sup>	Samples	c. c. of cooking liquor	Wt of sample after cooking	solids in cooking liquor	solids extracted from cooked spinach	Total solids	Time of storage in days	Condition
<b>FRENCH SPINACH</b>								
1	Not frozen not blanched	50	85	1,282	2,600	3,882	1	good
<b>Frozen in air not blanched</b>								
2	Frozen at -20°C stored at -20°C	40	80,5	1,378	2,265	3,643	16	good
3	Frozen at -50°C stored at -20°C	67	88	1,330	2,388	3,718	28	good
4	Frozen at -20°C stored at -20°C	31	80,5	0,994	2,604	3,598	29	good
5	Frozen at -20°C stored at -20°C	—	—	—	—	—	40	not very good but no bad
6	Frozen at -50°C stored at -20°C	—	—	—	—	—	40	not very good but no bad
<b>Frozen in alcohol blanched</b>								
7	Frozen at -20°C stored at -20°C	82	89,5	1,392	1,790	3,182	20	good
8	Frozen at -50°C stored at -20°C	32	91	0,624	2,008	2,632	29	good (probable loss of material during freezing)
9	Frozen at -50°C stored at -20°C	15	87	0,298	1,700	1,998	26	good (probable loss of material during freezing)
<b>ENGLISH SPINACH FROZEN IN ALCOHOL</b>								
10	Frozen at -40°C not blanched stored at -20°C	—	—	—	—	—	120	not very good but no bad
11	Frozen at -20°C blanched one min. stored at -20°C	—	—	—	—	—	120	very good (the best)
12	Frozen at -20°C blanched one min. stored at -20°C	45	65	0,720	1,487	2,207	120	very good (the best)
13	Frozen at -20°C stored at -5°C blanched	58	77,5	0,514	1,264	1,778	100	good
14	Frozen at -20°C stored at -5°C blanched	33	74	0,515	—	—	106	good
<b>English spinach frozen in air</b>								
15	Frozen at -5°C blanched for 1 min. stored at -20°C	37	67	0,642	1,514	2,156	120	good





Ἀποτέλεσμα τῶν πειραμάτων τούτων εἶναι ἡ πιστοποίησις ὅτι ὠρισμένα φρούτα καὶ λαχανικά, κουνουπίδια, σπανάκια, σέλινα, φράουλες καὶ ἄνθη ἀκόμη (γαρούφαλα) θὰ ἠδύνατο νὰ καταψυχθοῦν ἐντὸς οἰνοπνεύματος 96°, μὲ καλύτερα ἀποτελέσματα ἀπὸ τὰ μέχρι τοῦδε ἐπιτευχθέντα διὰ τῶν ἐν χρήσει μεθόδων.

Ἡ μέθοδος αὕτη ἐρευνᾶται ἤδη καὶ ἐπὶ ἄλλων προϊόντων μὲ πολλὰς ἐλπίδας εὐρυτέρας ἐφαρμογῆς αὐτῆς.

### ΓΕΩΡΓΙΚΗ ΤΕΧΝΟΛΟΓΙΑ.— Πειράματα ἀποξηράνσεως πατατῶν εἰς τὸν ἥλιον\*, ὑπὸ Σωκράτους Α. Καλογερέα. Ἀνεκοινώθη ὑπὸ τοῦ κ. Σ. Δοντᾶ.

Μετὰ τὰ σιτηρά, ἡ πατάτα εἶναι τὸ κυριώτερον γεωργικὸν προϊόν τὸ ὁποῖον παίζει ρόλον εἰς τὴν διατροφήν τοῦ ἀνθρώπου· ἡ χρησιμοποίησις αὐτῆς εἶναι ποικιλοτάτη ὡς τροφή τοῦ ἀνθρώπου καὶ τῶν ζώων, εἰς τὴν βιομηχανίαν δὲ πρὸς παρασκευὴν ἀμυλοσακχαροῦ, δεξτρίνης, οἰνοπνεύματος καὶ ἀμύλου. Τὸ τελευταῖον τοῦτο, καθαρὸν, εὐρίσκει ἐφαρμογὰς εἰς τὴν ἀρτοποιίαν, τὴν ζαχαροπλαστικήν, τὸ κολλάρισμα τῶν ἀσπρρορούχων, εἰς τὸν ἐξωραϊσμὸν τῶν ὑφασμάτων, τὴν πύκνωσιν τῶν χρωμάτων ἐν τῇ τυπωτικῇ, εἰς τὴν χαρτοποιίαν (πρὸς ἐπίχρισιν καὶ στίλβωσιν τοῦ χάρτου), εἰς τὴν χαρτοδετικήν, εἰς τὴν ἀποτύπωσιν χρωμάτων ἐπὶ τῶν ὑφασμάτων, εἰς τὴν παρασκευὴν καλλυντικῶν (πούδρα κτλ.), εἰς τὴν ἱατρικήν, εἰς καταπλάσματα, κλύσματα, διαφόρους ἐπιπαστικὰς κόνεις κτλ.

Εἰς τὰς ζυμώσεις πρὸς παρασκευὴν οἰνοπνεύματος κτλ. προσετέθη ἐσχάτως καὶ ἡ βιολογικὴ μέθοδος τῆς συνθέσεως λευκώματος κατὰ τὰς ἐργασίας Finks.

Ἡ παγκόσμιος παραγωγή πατάτας ἀνῆρχετο κατὰ τὸ 1934 εἰς 218 ἑκατομ. τόνους, ἐκ τῶν ὁποίων 149 ἑκατομ. παράγονται εἰς Εὐρώπην, μὴ συμπεριλαμβανομένης τῆς Ρωσίας· ἡ τελευταία αὕτη κατέχει σήμερον τὴν πρώτην θέσιν μὲ παραγωγὴν 51 ἑκατομ. τόνων, ἐνῶ ἡ Γερμανία, ἡ ὁποία προηγουμένως προηγείτο, ἔρχεται δευτέρα μὲ παραγωγὴν 46 ἑκατομ. τόνων· τρίτη ἔρχεται ἡ Πολωνία μὲ 33 ἑκατομ. τόνων. Ἀπὸ ἀπόψεως ὅμως ἀποδόσεων, πρώτη ἔρχεται ἡ Ὀλλανδία μὲ ἀπόδοσιν τῆς δεκαετίας 1924-1934 2584 χιλιογρ. τὸ στρέμμα, κατόπιν τὸ Βέλγιον μὲ 2070 χιλιογρ., ἡ Ἀγγλία μὲ 1684 χιλιογρ. καὶ ἡ Γερμανία μὲ 1464· ἡ κατὰ κεφαλὴν παραγωγή εἶναι μεγαλυτέρα εἰς Πολωνίαν, φθάνουσα τὰ 9,4 κουϊντάλια· εἰς Γερμανίαν εἶναι 7,1, εἰς Γαλλίαν 3,8, εἰς Ρωσίαν 2,8 κ.ο.κ.

Ἡ μεγαλυτέρα ἡμερησία κατὰ κεφαλὴν κατανάλωσις γίνεται εἰς τὴν Γερμανίαν, ἀνερχομένη εἰς 458 γραμ.

Παρ' ἡμῶν ἡ παραγωγή τῆς πατάτας, μολονότι ηὐξήθη τὰ τελευταῖα ἔτη καὶ

\* SOCRATIS A. KALOGEREAS.—Essais de conservation de pommes de terre par leur séchage au soleil.