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EFFECT OF SALTING (PARTIAL DEHYDRATION) GREEN PEAS PRIOR TO DEHYDRATION ON THE QUALITY OF DEHYDRATED PEAS

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It is only since World War II that systematic efforts have been made to produce stable and acceptable dehydrated peas.[1] Such efforts improved drying technology but difficulties were encountered in maintaining acceptable quality during dehydration as well as during storage. It is a lengthy process to dehydrate peas to a low final moisture content at which they can be stored satisfactorily. Conventional air-drying at high temperatures, aimed at shortening the drying time, resulted in damage to colour, texture, flavour, and rehydration capacity.[2] Moreover, rehydration of such material was found to be slow and frequently incomplete.[3]

Partial dehydration of fruits and vegetables by osmotic extraction of water using sugar, honey etc., has been tested frequently in the past.[4–6] These tests suggested that partial dehydration of peas using saturated salt solution seemed to offer the possibility of reducing the present excessive drying time for peas. Partial dehydration might also result in low final moisture contents thereby increasing the shelf life and stability of dried peas.

Materials and Methods

Pea pods were washed, hand shelled, and size grade 6 peas (13/32 in dia) were collected. 2¼ Lb peas were weighed, steam-blanched for 2 min, sulphited (peas were dipped for 1 min in a solution containing 0.7% sodium sulphite and 0.9% sodium carbonate at 100°F), slit with a sharp blade, and then divided into two parts. One part was placed in a saturated salt solution (26% NaCl) held in an oven at 180°F for 4 hr. The remaining peas, kept in a tray were also placed in the oven. Both samples were removed from the oven at the same time, rinsed with water, and dehydrated under the following conditions:

Dry-bulb temp (°F)	Wet-bulb temp (°F)	Drying time (min)
200	101	20
150	92	280

After dehydration, samples were analysed for moisture contents,[7] chlorophyll conversion to pheophytin,[8] and rehydration ratio. The latter was determined by the method of Shah.[9] Ten gram dried peas were weighed into tared steel mesh baskets, and placed in beakers of boiling water for 10 min. Peas remained in the hot water for a further period of 50 min after which they were drained on a sieve and weighed.

A second sample of peas was similarly prepared and salted by soaking for 2 hr at 150°F, and treated as described above.

Dehydrated peas were sealed in polythene pouches and stored at ambient temperature. The results of storage analysis are presented in Table 1, and chlorophyll conversion and drying rate curves are shown in Figs. 1 and 2 respectively.

Results and Discussion

Salted materials showed a much lower moisture content than unsalted control samples dehydrated at the same time, while chlorophyll conversion was much higher in the salted peas (Table 1, Fig. 1). The rehydration ratio of salted peas was slightly lower than that of the control.

TABLE 1. EFFECT OF SALTING ON THE QUALITY OF DEHYDRATED PEAS.

Treatment in 26% salt solution	Storage time (days)	Moisture content (%)	Chlorophyll conversion (%)	Rehydration ratio
Control	0	7·02	50·0	3·4
4 hr at 180°F	0	3·00	88·9	3·2
Control	0	6·79	45·4	3·4
2 hr at 150°F	0	2·46	67·6	3·3
Control	30	6·75	57·4	3·4
2 hr at 150°F	30	2·50	68·1	3·3
Control	60	6·76	60·1	3·4
2 hr at 150°F	60	2·55	69·9	3·3

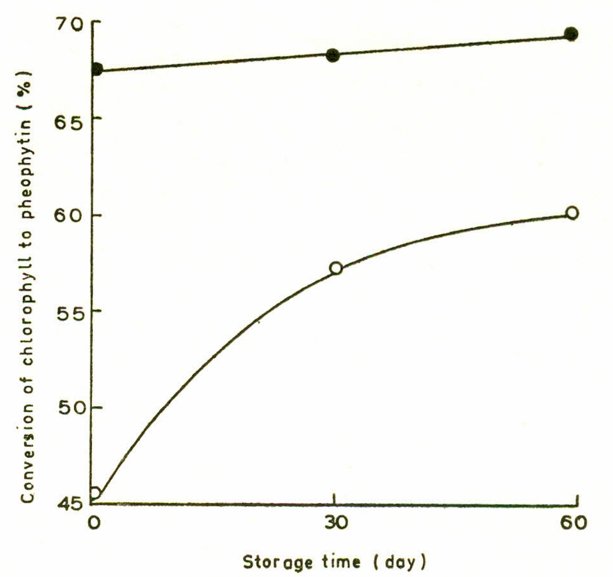

Fig. 1. The effect of salting treatment and storage time on the conversion of chlorophyll to pheophytin. ● Salted sample O Unsalted (control) sample.

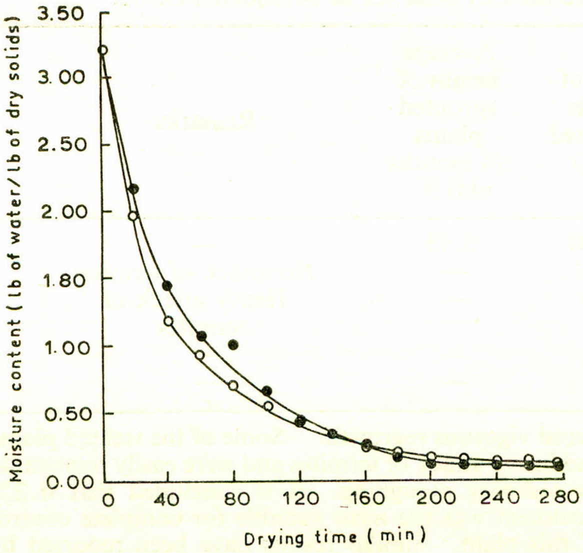

Fig. 2. Drying rate curves for salted and unsalted control peas. ● Salted sample; ○ unsalted (control) sample.

Because of the somewhat unexpected results on the salted peas, further experiments were carried out to examine the effects of salting on drying rate and quality of dried product and changes in salted peas during storage (Table 1).

Samples of control and salted peas analysed immediately after dehydration showed results similar to those obtained from the previous experiment, i.e. salted peas showed a lower moisture content, higher chlorophyll conversion, and a similar rehydration ratio. Salted peas dried more slowly than unsalted ones during the first 140 min of the drying cycle but after this the increase occurred (Fig. 2), also salted peas took only 180 min to reach that moisture level which control samples attained after 280 min.

Storage of control dried peas for 60 days at room temperature (average temp. 70°F) resulted in further chlorophyll conversion (from 45.4 to 60.1%) but moisture contents and rehydration ratios remained unchanged. Salted peas, showed a slight increase in moisture content, a small increase in chlorophyll conversion (67.6–69.9%), and no change in rehydration ratio. The reason for the high initial conversion of chlorophyll in salted peas (Fig. 1) is uncertain. It is possible that salt penetration could have increased cell damage with a consequent increase in conversion of chlorophyll at elevated temperature of dehydration, but it is more likely that the difference was due to a difference in their temperatures prior to dehydration, since salted peas were in contact with salt solution in an oven at 150–180°F, while control peas were on a tray in the oven not in contact with liquid.

The appearance of salted peas was much different from unsalted dehydrated peas. The skin of the former was considerably bleached and cotyledons were almost colourless. Salted peas were almost the same size as fresh ones but their flavour and odour were quite objectionable. This may have been due in part to a higher rate of lipid oxidation at the low moisture level.[10,11]

It is apparent from these experiments that salting under the conditions described resulted in some undersirable organoleptic changes and in any further tests this aspect must be given more careful consideration. Less stringent predrying treatments may produce desirable low final moisture contents in peas without the undesirable organoleptic characteristics.

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SUPPRESSION OF REGROWTH OF MESQUITE (PROSOPIS SIPCIGERA) BY TRIOXONE '100' (2,4,5-TRICHLOROPHENOXY ACETIC ACID)

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Mesquite, dewi (*Prosopis sipcigera*) is a deep rooted hard wood tree. It bears pods which are rich in

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TABLE 1. THE EFFECT OF TRIOXONE '100' APPLIED ON CUT SURFACE OF MESQUITE PLANTS.

Treatment	Dia of the thickest clump of plant (cm)	No. of clumps/ plant	No. of plants sprouted (%)	Average height of sprouted plants (4 months old) ft	Remarks
Control (untreated)	2.17	5.55	100.00	5.95	—
0.1%	2.22	5.65	0.01	—	No attack of termites
0.2%	2.38	6.57	0.0	—	Heavy attack of termites
0.3%	2.61	4.89	0.0	—	—
Average	2.345	5.66	—	—	—

sugars and are important as live stock feed. Its seeds are used for food by South Western Indians. This plant varies in size from a few feet to as high as 30 ft. This plant is commonly found alongside the railway track, canal banks, drainage channels and in some neglected areas. The seeds of this bushy plant spread into fields through canal water. It grows very thick and is of spreading nature. If fallow land becomes full of this species it is very difficult to eradicate these plants either by cutting or by burning. This woody plant has become a constant source of trouble to the farmers in Hyderabad division of Sind.

Different chemicals have been used to kill the hard wood plants. The majority of these plants is sensitive to both 2,4-D and 2,4,5-T. Fisher *et al.*[2] have studied the control of mesquite in Texas by application of 2,4,5-T. Gibbs[3] obtained 100% control of regrowth in sweet gum oak trees by 2,4,5-T. Similar findings have been reported by Peevy and Burns[7] with 2,4,5-T. Iqbal has reported that 2,4,5-T gave the best results in the control of mesquite. He used 2,4,5-T as spray which required more than one application.[5]

Since the removal of this plant is difficult and rapid regrowth occurs, the present investigations were aimed at suppressing its regrowth with the help of Trioxone, an ester of 2,4,5-T. The experiment was undertaken in 4 acre area of fallow land covered with thick growth of mesquite plants. Four treatments, i.e. control (diesel oil only), 0.1, 0.2, and 0.3% solutions of Trioxone '100' in diesel oil were used and the treatments were replicated four times. Before chemical application the plants were cut 6 in above the ground just before the active regrowth season (March). The number and average thickness of each clump per plant were recorded. Trioxone '100' solutions were applied on the cut surfaces and the stumps were wet completely down to the base to ensure complete kill. Twenty five plants were treated for each treatment and the chemical was applied only once. Extreme care was taken to avoid skin contact as the chemical is toxic.

Treated plants were completely killed even at the lowest level (Table 1). Untreated control plants produced vigorous regrowth. Some of the treated plants had heavy attack of termites and were easily removable by ordinary ploughing. It is concluded that 0.2% treatment was the most suitable for complete control of this plant. Similar results have been reported by Fisher *et al.*[2] Hay[4] and Iqbal.[5]

Little is known about the mechanism of toxicity of this chemical. Crafts and Robbin[1] have discussed the mode of action of 2,4-D and other herbicides of chlorophenoxy type and have reported that these herbicides are translocated to the regions of active metabolism and induce abnormal cell division such as callus or tumor formation and finally leads to death. Muni[6] has also reported that crushing of phloem tissue and continued action results in plugging of xylem and the plant ultimately dies.

It is concluded that dewi plants can be easily eradicated from this area of Sind with the use of this chemical. Plants on the canal banks should be treated with this chemical which are the main source of distribution of seeds into agricultural lands.

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