Toxic Fruits in Frozen Peas

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Solanine-containing fruits were found in a sample of prepacked frozen peas. The fruits were identified and the presence of alkaloids was confirmed using thin layer chromatography. The toxicity of solanine-containing fruits is discussed.

A sample of prepacked frozen peas which came into the Authors' possession contained foreign plant material. The sample came from a crop grown in Lincolnshire, harvested in July 1970, and processed immediately.

Handpicking of the sample gave 3·6 g (0·8 per cent. of the total pack contents in the frozen wet state) of plant material other than peas. The foreign plant material resembled a fruit in macroscopical structure, being a darker green than the peas and bore a persistent calyx and pedicel. The fruits had a bilocular ovary with many ovules on an axile placenta and the seeds had curved embryos. Their structure indicated that they were fruits from the plants of the family *Solanaceae* and genus *Solanum*.

Morphologically, three species of *Solanum* were considered as the origin of the foreign plant material. Of these *Solanum Dulcamara* (Bittersweet or Woody Nightshade) has the widest distribution in the British Isles. The fruits are ovoid and although the immature fruits are green they become red on ripening. *S. nigrum* (Black Nightshade) also has a wide distribution. The mature fruits are normally black although persistently green varieties have been reported[1]. *S. sarrachoides* is very similar to *S. nigrum* but is more densely hairy and the calyx becomes enlarged after flowering. The fruit remains green when mature and it occurs mainly in East Anglia. Whilst *S. dulcamara* is a woody perennial with a climbing habit, *S. nigrum* and *S. sarrachoides* are erect annuals or biennials with a height of 1–2 ft and one of the latter two species was indicated in this case. Because of the small amount of material available complete identification was impossible.

Isolation and Identification of Alkaloid

The isolated foreign plant material was extracted with hot 95 per cent. ethanol for 1 hour and the extract evaporated to dryness in vacuo. The residue was examined by TLC on 250 μ thick silica gel G plates impregnated with 3·5 per cent. boric acid solution and eluted with acetone : methanol : water (75:15:10)[2]. Spraying with antimony trichloride in concentrated HCl (3 g per ml) revealed a purple spot[3] with the R_f value equal to that of the steroidal glycoside solanine. The extract was hydrolysed with 2 N HCl in 95 per cent. ethanol for 30 minutes to release the aglycone which was then precipitated with

ammonia solution and extracted into chloroform. This second extract was examined by TLC on 250 μ thick silica gel plates eluted with dilute ammonia solution : methanol (1·5:100)[4]. The separation was visualised with the antimony trichloride reagent and showed a spot with the R_f of solanidine, the aglycone of solanine.

There are conflicting reports[5] on the breakdown of solanine during the normal cooking process. To determine the stability of solanine in the present case, peas containing the fruit adulterant were cooked in boiling salted water for 7 minutes, the maximum time specified on the pack. The cooked material was extracted and examined as described above. There was no apparent loss of steroidal compound and the hydrolysed extract gave colour responses with sulphomolybdic and sulphovanadic acids characteristic of solanidine.[4]

Discussion

The steroid alkaloidal glycoside solanine is toxic, exerting a direct irritant effect on the mucosa of the gastro-intestinal tract, and after absorption into the blood stream it causes haemolysis and cholinesterase inhibition[1,5]. The amount of solanine in plants depends on a number of extrinsic and intrinsic factors and this has led to confusing reports on their relative toxicity. The average solanine content of the fruits of both *S. nigrum* and *S. sarrachoides* is 0·7–1·0 per cent. of the dry weight. This would suggest a total solanine content in a 1 lb pack of frozen peas of 3 to 4 mg. The toxic dose level of solanine is 20–25 mg in adults and 4 to 5 mg for small children[4]. Whilst the normal meal portion of this sample of frozen peas did not reach this level it is clear that this type of contamination is a potential danger. With the increased use of mechanical harvesting it is easier for such toxic material to be included in a crop and missed in further processing. Remedial action must be taken at the growing stage to eliminate toxic weeds.

References

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Calculation of the Lean Meat Content with Special Reference to the Corrections for Nitrogen derived from Cereal and Milk

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A formula modified from that previously published is presented for the calculation of the lean meat content of products. Apart from allowances for the permissible proportions of fat in lean meat and outside fat, provision is made for the presence of any type of cereal filler of either known or assumed nitrogen content. Further formulae are also presented which enable the analyst to allow for the presence of dried milk in a meat product.

The general formula previously reported[1] for the calculation of the lean meat content of products assumes that the filler used is wheat rusk as normally used in fresh sausages:

$$\text{LM } (\textit{per cent.}) = \frac{100N_T - F_{Ext.}\,N_M\left(\frac{100}{F_F} - 1\right) - 2C}{N_M\left(1 - \frac{F_L}{F_F}\right)}$$

where LM = The percentage of "lean meat" in the product (containing invisible fat).

N_T = The total percentage nitrogen content of the product.

N_M = The mean nitrogen content of the meat used (expressed as a percentage of the fat-free meat).

$F_{Ext.}$ = The percentage of total fat extracted from the product.

F_L = The percentage of fat in the "lean meat" (LM).

F_F = The percentage of fat contributed by the "outside fat" in the product.

C = The percentage of total carbohydrate (by difference)