CAROTENOID CONTENT AND PROVITAMIN A VALUES OF PEA SEEDS WITH ORANGE VS. YELLOW COTYLEDONS

Ludwicki, J. Agricultural Academy, Warsaw, Poland
Swiecicki, W. K. Plant Experiment Station, Wiatrowo, Poland

Elsewhere in this volume a new seed character is described, viz. orange cotyledons. Because the difference in color in comparison to typical yellow seeds was very clear we decided to analyze the pigment extracts by chromatography. Seeds of two lines, Wt 11145 (orange cotyledons) and Wt 3527 (typical yellow cotyledons), were analyzed.

The material was ground and hydrolyzed (KOH in alcohol) prior to extraction with hexane.

Chromatographic separation of carotenoids was done by MgO column chromatography using hexane and 20% solution of acetone in hexane as solvents. For the calculation of carotenoid content, tabular values of were used, viz: B-carotene 2592, B-cryptoxanthin 2386, lutein 2550. For determination of the provitamin value the biological activity of S-carotene was taken as 100%, 6-cryptoxanthin as 57% and lutein as 0.

Chromatographic analysis of pigment extracts from seeds of line Wt 3527 (yellow cotyledons) showed the presence of two carotenoid fractions (Fig. 1). Their elution was possible only after using a 20% solution of acetone in hexane. Use of less polar solvents did not cause visible migration of the pigments. Nor did the above conditions make possible the removal of trace levels of blue-pink pigment (probably anthocyanin) which formed an isolated band at the top of the column.

Chromatographic separation of pigments from seeds of line Wt 11145 (orange cotyledons) revealed three bands of carotenoids (Fig. 2). The first, most mobile fraction which did not occur in the "typical" yellow seeds was eluted by pure hexane. Two remaining fractions of carotenoids were comparable with line Wt 3527. Again, the band of blue-pink pigment was observed.

Spectral investigations showed (Fig. 3) that carotenoids in seeds of line Wt 11145 had the maximum absorption in the following wave lengths (nm):

I fraction - 425, 450, 477
II fraction - 425, 4 46, 475
III fraction - 422, 445, 475

On the basis of spectral data the respective fractions were identified as I - 6-carotene; II - ft-cryptoxanthin; III - lutein.

Carotenoid pigments isolated from seeds of Wt 3527 (Fig. 4) had maximum absorption in wave lengths (run):

I fraction - 425, 4 46, 477
II fraction - 422, 4 45, 475

The above values indicate the presence of 6-cryptoxanthin and lutein.

Table 1 gives the content of carotenoids and provitamin.

Thus it appears that seeds of Wt 11145 have more than double the amount of biologically active f.-cryptoxanthin, plus a small amount of B-carotene, in comparison with the yellow cotyledon line. The provitamin activity was nearly tripled. The higher content of lutein in line Wt 11145 is not significant from a nutritional point of view.

Table 1. Carotenoid content (µg in 100 g) and provitamin activity (in µg of β-carotene) extracted from the seeds of Wt 3527 (yellow cotyledons) and Wt 11145 (orange cotyledons)

Carotenoids	Line	
	Wt 3527	Wt 11145
β-carotene	-	10
β-cryptoxanthin	61	158
Lutein	313	458
Provitamin activity	35	100

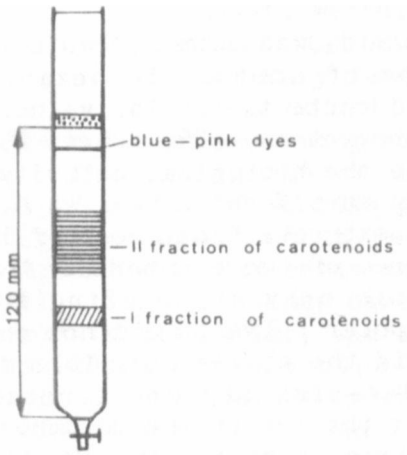

Fig. 1. Separation of carotenoids on MgO chromatography column for line Wt 3527.

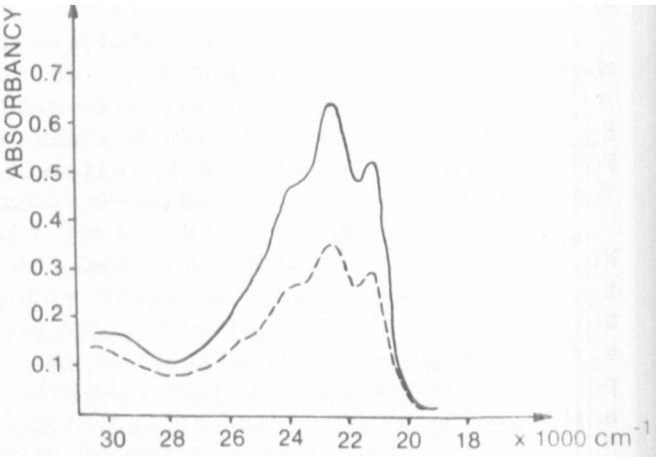

Fig. 4. Absorption spectra of carotenoids isolated from seeds of line Wt 3527; β-cryptoxantin (---), lutein (——). Values expressed as reciprocal of wave length.

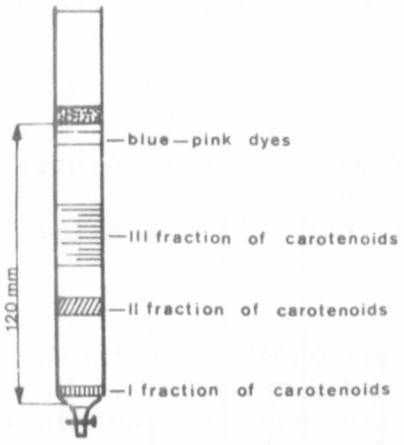

Fig. 2. Separation of carotenoids on MgO chromatography column for Wt 11145.

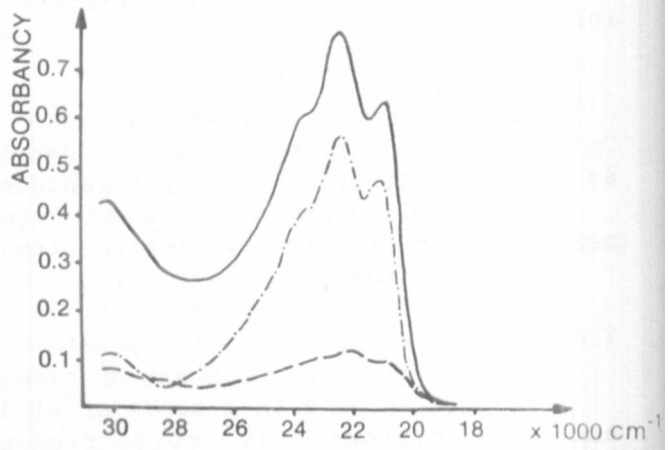

Fig. 3. Absorption spectra of carotenoids isolated from seeds of line Wt 11145; β-carotene (---), β-cryptoxantin (——), lutein (—·—·).