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PROTEIN-LIPID COMPLEXES OF SUNFLOWER SEED DURING POST-HARVEST TREATMENT AND STORAGE

Along with easily obtainable free lipids (A), it is of interest to conduct research into some other lipids, i.e. those bound with the protein part of the seeds (B) and tightly bound lipids (C).

Studies of lipids (B) help find ways of preparing seed for processing to effect optimal quantitative and qualitative oil extraction and for obtaining proteinic isolates.

The qualitative content of lipids (B) of the high oil variety Peredovik was studied following the fractionation of lipoproteids.

Proteins were extracted by triaglycinate buffer, pH 8.3. Extract was centrifuged at 15,000 r.p.m. Hardly soluble protein fractions were obtained from insoluble residue by triaglycinate buffer containing 1% detergent.

To separate fractions of reserve and structural proteins from low molecular admixtures (acids, salts, phenols, etc.) and to concentrate further protein, we have used Sefadex G-25. Separated and concentrated centrifugates were fractionated by electrophoresis in polyacrilamide gel.

Isolated plots of gel containing lipoproteids were homogenized in ethanol medium and following treatment with alcohol with boiling and alcohol elimination were extracted with diethyl ether.

Lipid (B) extracts from lipoproteid complexes have the following composition (%): triglycerides - 40.4; phospholipids - 30.1; free fatty acids - 7.4; sterines - 4.2; di-glycerides - 3.1; mono-glycerides - 1.6; sterin esters and hydrocarbons - 1.2; carotinoids and un-identified fraction - 12.0.

Fatty acids were represented by oleic (42.2%), linoleic (39.5%), pulmitic (7.9%), stearic (4.9%), palmitoleic (1.8%) and other acids (3.7%).

Considerable amounts of (B) lipids are found in sunflower seed from the first days after the end of flowering. Total lipids (A + B + C) increase along with maturation, reaching the maximum (67-68% of absolutely dry matter) by the 28th day after the end of flowering.

By the end of ripening total lipids slightly decrease, being higher in the seed harvested by the two-phase method. The group content of the bound lipids changes during the whole period of maturation. The content of the polar groups of lipids being at maximum by the 21st day after the end of flowering diminishes by the end of maturation. The content of triglycerides and free fatty acids in the bound state is growing.

Close relationship is observed between the content of the main fatty acids - linoleic and oleic - in lipids (A) and (B).

When the seeds are thermally dried the mutual transfer of lipids from one bound form into another is observed at the drying temperature of 60°C. At higher temperatures the relative proportion of bound lipids (B) in the total lipid content is decreased. At further temperature increase the relative proportion of polar lipids (B) further decreases and the proportion of triglycerides increases.

The increase of free fatty acids content in lipids (B) is only observed at the drying temperature of 120°C. When seeds dried up at different temperatures and seeds harvested by two-phase methods (without thermal drying) are dried under similar conditions, total lipids are comparatively stable during the whole period of storing (11 weeks).

The content of lipids (A) increases to 60.8% by the end of the first week of storage and then decreases by 0.47% (as compared with

initial seeds) by the end of the storing period. The relative content of bound lipids (B) in total lipids is increased by the end of storage.

The temperature after-effect on the residual oil content of the seeds during storage is of some interest.

All lots of dried seeds showed an increase of residual oil content by the end of the first week of storage. The increase was more pronounced with the higher temperature of drying.

The maximal residual oil content was observed in the seeds dried at 120°C by the end of the first week of storage.

During this period the polar groups of lipids are released in the seeds, while the proportion of bound triglycerides goes up.

The affer effect of drying must be considered in processing sunflower seeds depending on the tasks set - maximum or optimum qualitative and quantitative oil output.

Thus, we have found an essential influence of the temperature of the drying agent on the quantitative and qualitative content of the bound lipids complex. The formation of lipids (B) under heat treatment represents a process characterized by a certain inertia. Processes taking place in lipid complexes of the seeds being stored after drying are similar and represent the continuation of the processes characteristic for the period of the thermal treatment of the seeds.

These changes in lipid complexes are observed during first days and weeks of the storage and their duration is proportional to the temperature of the seed heating. Processing of seeds with an incomplete change of lipids (B) resulted in decreased oil output. The quantity of (B) and (C) lipids in sunflower seeds after drying was influenced by seed heating temperature during thermal drying, initial seed moisture and duration of dried seed storage.