

# SOLVENT OIL EXTRACTION FROM SUNFLOWER KERNELS: THERMODYNAMIC ASPECTS

R. COSTANTINO\*, E. EMMI\*\* and G. SODINI\*

## THE PROCESS

Sunflower meal has its major outlet as feedstuff and is widely produced using the combined press/solvent extraction process.

During the pressing stage temperature rises up to 130-150°C and the cake undergoes partial denaturation which adversely affects the biological and functional properties of proteins.

The obtainment of both edible flour and protein concentrate requires to operate, under mild conditions, throughout the whole process.

The so-called "solvent Extraction Process" makes it possible to obtain a flour suitable either for both animal and human nutrition or for the production of protein concentrate. To manufacture such products it is necessary to process seeds which have been almost completely dehulled.

Several methods have been proposed to dehull sunflower seeds, still used as feedstuff with a husk content of around 10%.

Such methods can be employed for reducing in the final products the husk content down to 5-6%, a threshold value which could be considered as acceptable for both edible flour and concentrate.

However, two main problems have, so far, hindered the production of such protein products:

- One is relevant to the difficulty of extracting oil from sunflower kernels with a very low fibre content; in fact the technologies currently available to oil industries still discourage to attempt

---

\* Laboratori Ricerche di Base, Monterotondo (Roma), Italy

\*\* Direzione Ricerca e Sviluppo, San Donato Milanese (Milano), Italy.

a direct solvent extraction of sunflower kernels because of the poor technical and economic attainments;

- The other one is relevant to the difficulty of removing chlorogenic acid, the main phenolic component, which is an undesirable darkening pigment.

To fulfill the existing technological gap which has, to some extent, prevented a more beneficial exploitation of such an important industrial crop, worldwide distributed, ASSORENI has devoted quite a substantial research effort to the development of a novel technology capable of:

- Overcoming the dual press/solvent extraction process through a direct solvent removal of oil from sunflower kernels under mild operating conditions in order to attain the lowest degree of protein denaturation;
- Removing, to a large extent, chlorogenic acid, with an appropriate solvent system which does not remarkably solve proteins and maintains practically unaltered the product functional properties.

A pilot plant capable of processing 4 mt/day of seeds is currently running in Italy for the production of both defatted flour and protein concentrate.

## **THE PRODUCT**

ASSORENI technology yields sunflower protein products —flour and concentrate— having remarkable functional, flavor and biological characteristics which make them particularly suitable for human nutrition.

The high product functionality, strictly connected with the low degree of protein denaturation, is expressly displayed by the high fat absorption and emulsifying capacity. Both properties suggest the utilization of such products as ingredients in meat emulsions (e.g. sausages, hot dogs, sauces).

Laboratory tests have evidenced remarkable structural properties of textured proteins (flour and concentrate) in formulations like hamburgers, fabricated meats and canned products.

These properties and a flavor profile close to the neutrality make

it possible to introduce sunflower proteins in various food formulations even at high level of extensión.

Sunflower proteins are also characterized by the absence of anti-nutritional factors, such as indegestible carbohydrates and digestive enzymes inhibitors, which promises a wide range of product applications.

Product development is still under way to assess the potentiality offered in food technology by the whole set of such outstanding properties.

