

HUSKS STRUCTURE OF SUNFLOWER ACHENES.
GENETIC VARIABILITY.

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SUMMARY.

Transversal sections through sunflower achenes at different ripening stages show peculiar patterns in the pericarpic sclerenchyma.

It does exist a wide variability of this tissue components in their transverse architecture, expressed according to the cultivar.

INTRODUCTION

Our work consisted in studying the noticeable variability of the structure of the sunflowers achenes.

According to GASSNER (1973) in LEPRINCE (1987), the sunflower achenes's husk's admit from inside to outside:

- one epidermis with coupled hairs
- one hypodermis with several layers on top of phytomelanoidin layer
- one sclerenchyma occur in several bulks of cells separated by lines of unligified cells
- one loose parenchyma

According to PERCIE DU SERT and DURRIEU (1988):

- epidermic layer which determine the colour of the achene
- the lignification of the sclerenchyma's cells walls is more important for the extern cells.

As far as we are concerned, we have stressed an original aspect of the sclerenchyma of the husks which according to the kind of cultivar, is going to present a strong variability.

MATERIAL AND METHHODS

We have worked upon 6 cultivar : IBH 166, Mirasol, Frankasol, Albena, Euroflor and Viki, these have been cultivated in the experimental areas of the C.E.T.I.O.M. network.

Our researchs have focused both on ripe and unripe achenes.

First, we have observed transversal sections through a photonic microscope. These sections have been taken height in the middle of the achenes and then have undergone three colorations: with astra blue (only designed for

colouring the cellulosic membranes), then with the auramine and safranin (which are specifically designed for lignines and which present a polychromatic aspect according to the degree of lignification of the cell walls).

But this technique had two drawbacks: first it turned out to be fastidious and secondly it did not entail satisfactory results and this because of the proprieties of the material itself.

So we have created a new technique which is better fit for this particular material and easy to carry out. thus a great number of observations can be made.

In order to perform this technique we take a piece of half a husk at half the height of the achenes.

These fragments are dived into the "carmin aluné vert d'iode" during ten minutes and then are rinsed out, dried and stucked on a support.

The observations are made through a binocular lense.

The colouring makes appear: the cell walls either in pink or white and the lignified walls in blue-green.

However, the walls very much lignified are impervious to the colouring and this appear in slight blue.

RESULTS

The observation of the transversal sections has enabled us to reveal the existence of two types of sclerenchymatic bulk of cells :

- Those that we name "type 1" are tight, and corner-like, the small side is situated towards the outside of the husk and the wide side juts out inside the husk. On the sections of the husks of unripe achenes, this bulks appears to have on their basis a vascularization which turns out to be totally compressed during the developpment of the ovule.

- Those that we name "type 2" are broader do not juts out inside the husk and are never accompanied with a vascularization.

Sometimes, "type 1" and "type 2" regularly alternate, in other times, on the contrary, several bulks of "type 2" separate two bulks of "type 1", we thus name such portions of husks "open space area".

The organization of the alternation between the two types of bulks as well as the relative width of the bulks of "type 2" consist of what we call "the characteristics of transversal architecture" of the husk.

The relative width of the bulks of "type 2" is strongly correlated on the level of splitting-up of the sclerenchyma by the lines of unligified cells.

These characteristics are strongly variable according to the cultivar. (ref. pictures 1 and 2)

Mirasol, characterizes itself by sclerenchymatic bulks of "type 2" which turn out to be very wide.

The pericarpic sclerenchymas of the achenes of the Mirasol cultivar are little splitted up and the bulks of "type 1" are scarcely found in them. (ref. graphic 1)

On the other hand, as far as this cultivar is concerned the width of the bulks of "type 2" noticeably increases with the position of the achene on parastic. The dimension of the achenes decreases towards the center of the capitule. To say it briefly, with Mirasol, towards the center of the capitules, the size of the achenes decreases and the width of the sclerenchymatic bulks of "type 2" increases. (ref graphic 2)

Viki, presents characteristics which are very much like those of Mirasol. (ref. graphic 3)

On the contrary, Frankasol characterizes itself by pericarpic sclerenchymas very much splitted, with narrow bulks of "type 2" and numerous bulks of "type 1". (ref. graphic 3)

BH 166, Albena and Euroflor resembles Frankasol as far as the characteristics of the transversal architecture of the husks are concerned. (ref. graphic 1 and 3)

However, Euroflor characterizes itself by the apparition of a defect of differentiation of the sclerenchymas which appears to be all the more important since the conditions of cultivation are bad and that we have to do with achenes taken from the center of the capitules.

In the worst of the case, we cannot tell the bulks one from the other.

DISCUSSION AND CONCLUSION

The observation of pieces of husks through a binocular lense after the colouring with "carmin aluné vert d'iode" is a quick methode and turns out to be well adapted to the study of "the characteristics of the transversal architecture" of the husks of achenes of sunflowers.

However, it is necessary that the sclerenchyma should be well differenciated other wise (as it turns out to be the case for Euroflor) the observer runs the risk to underrate the splitting-up of the sclerenchyma.

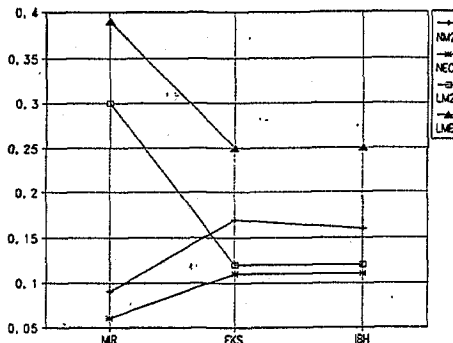
The characteristics of the "transversal architecture" probably play an important part in the mechanic resistance of the husks in the moment of the distortion or of the break.

Here, we are dealing with an agroindustriel problem of importance : the hulling of the batches of achenes of sunflowers designed for the oil production.

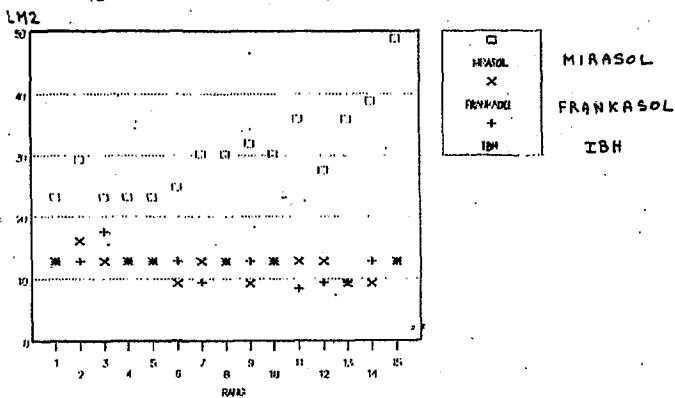
Our works on the transversal architecture of the husks as well as the methode of observation that we have finalized should find an application :

- in fundamental studies on the characteristics of various origins of achenes on the genetical level as well as the pedoclimatic level
- also in studies dedicated to the selection of new cultivar with a good hulling.

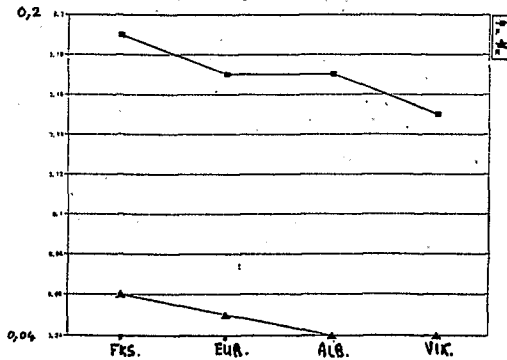
GRAPHIC 1 : Representation of NEWMAN-KEULS tests, associated at the first variance analysis.
According to the Cultivar effect.



GRAPHIC 2 : Representation of NEWMAN-KEULS tests, associated at the first variance analysis.
According to the effect of the position of the achene in the parastic.



GRAPHIC 3 : Representation of NEWMAN-KEULS tests, associated at the first variance analysis.
According to the Cultivar effect.



ABBREVIATIONS EMPLOYED

NM2 : number of the bulks of "type 2" for each semi-husk.

NEO : number of "open area" for each semi-husk.

LM2 : mean width of the bulks of "type 2".

F : frequency of the lines of unignified cells for each semi-husks.

R : relative dimension of the bulks of "type 2".

PICTURE 1 : First variance analysis.

F1 = Cultivar (Mirasol, Frankasol, IBH166).

F2 = Position of the achene on the parastic.

VARIABLES	FACTORS	TEST F	PROBA
NM2	F1	215,68	0
	F2	3,4	0,0001
	INTER F1 F2	2,7	0,0001
NEO	F1	245,84	0
	F2	11,03	0
	INTER F1 F2	3,42	0
LM2	F1	893,48	0
	F2	8,11	0
	INTER F1 F2	11,8	0
LME	F1	318,04	0
	F2	6,65	0
	INTER F1 F2	3,75	0

PICTURE 2 : Second variance analysis.

F1 = Cultivar (Albena, Euroflor, Frankasol).

F2 = PLant.

VARIABLES	FACTORS	TEST F	PROBA
F	F1	53,57	0
	F2	0,3	0,83
	INTER F1 F2	3,13	0,0104
R	F1	65,84	0
	F2	0,58	0,64
	INTER F1 F2	1,66	0,15

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