

LIPID-PROTEIN INTERACTIONS AND DURUM WHEAT GLUTEN VISCOELASTICITY

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We focused on the effect of semolina lipids, namely here the proportion of neutral lipids within total lipids, on durum wheat gluten elastic recovery.

Four durum wheat cultivars belonging to "type 42" and to "type 45" according to gamma-gliadin electrophoretic patterns were grown in six locations on North and South of France. After extraction of semolina total lipids by Folch's method (Tsen et al, 1961), neutral lipids were quantified within total lipids by densitometry of TLC plates. The elastic recovery, which is related to cooked pasta firmness (Damidaux et al, 1978), was determined with a Viscoelastograph on manually extracted glutens.

From A. O. V., the following results were evidenced:

1 - lipids: the ratio of neutral lipids to total lipids changed with durum wheat cultivar (7,6 % of total variation ** growing location (21,2 % of total variation **) and cultivar x location interaction (69,6 % of total variation **), the variations around the general mean being always highly significant. In others word, that ratio gave only partly an account of durum wheat intrinsic quality because it was strongly influenced by environmental conditions.

2' - gluten elastic recovery: its variation around the general mean was dependent mainly on cultivar (79,2 % of total variation ~~##~~), but it was noticeable a highly significant effects of growing location (6,1 % of total variation ~~##~~). The cultivar importance in total fluctuation was following upon "type 42" and "type 45": indeed the percentages were respectively: cultivar: 16,9 % ~~##~~ and 56,0 % ~~##~~; growing location: 78,4 % ~~##~~ and 11,4 % NS; interaction 1,9 % NS and 23,2 % ~~##~~. Environnement played therefore a primordial role within a same type.

Generally, there was an opposite evolution of ratio of neutral lipids to total lipids and of gluten elastic recovery.

It can be suggested that durum wheat lipid nature - and not their quantity - is able to influence the expression of intrinsic quality primarily determined by gluten proteins and to explain - at least partly - the observed fluctuation concerning the cooking quality between cultivars according to growing location. Complementary studies on ripeness and on both protein and lipid accumulation are necessary for characterizing the nature of lipid-protein interactions implicated in durum wheat quality.

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AIM

Durum wheat gluten elastic recovery is related to pasta cooking quality, mainly firmness (Damidaux et al., 1978). This work is part of general studies on pasta cooking quality made in our laboratory and it is focused on the effect of semolina lipids, namely the ratio neutral lipids/total lipids on gluten elastic recovery.

METHODOLOGY

Four durum wheat cultivars belonging to "type 42" and to "type 45" were grown in six french locations. Total lipids of semolina were extracted by Folch's method and analyzed by TLC and densitometry for the quantification of neutral lipids within total lipids. The elastic recovery was determined as previously described, with a viscoelastograph on manually extracted gluten.

RESULTS AND DISCUSSION

1° LIPIDS (TABLE 1)

The analysis of variance gave the relative importance of the factors on the ratio neutral lipids/total lipids:

Durum wheat cultivar:	7.6%**
Growing location:	21.2%**
Interaction:	69.6%**
Error:	1.6%

The ratio was strongly influenced by environmental conditions.

2° GLUTEN ELASTIC RECOVERY

(TABLE 2)

By the same way, we obtained the following results:

	<u>All samples</u>	<u>"type 45"</u>	<u>"type 42"</u>
Durum wheat cultivar:	79.2%**	56.0%**	16.9%**
Growing location:	6.1%**	11.4%NS	78.4%**
Interaction:	4.3%**	23.2%*	1.9%NS
Error:	10.4%	9.4%	2.8%

The main factor was the cultivar but the environment played a significant role in type 42.

TABLE 1

RATIO OF NEUTRAL LIPIDS TO TOTAL LIPIDS IN DURUM WHEAT SEMOLINA (IN %)

LOCATION	"45"		"42"		MEAN
	AGATHÉ	WA6755	KIDUR	UNIDUR	
MONTPELLIER	63.4	43.4	62.5	62.6	58.0
CASTELNAUDARY	55.8	44.5	53.0	52.9	51.6
LA BEGUDE	58.9	56.7	61.4	64.4	60.4
MAISSE	53.4	73.5	49.1	50.9	56.7
SOURS	54.5	44.9	36.3	63.3	49.8
BAZOCHES	59.0	50.2	67.3	59.8	59.1
MEAN	57.5	52.2	54.9	59.0	55.9

TABLE 2

DURUM WHEAT GLUTEN ELASTIC RECOVERY (IN MM)

LOCATION	"45"		"42"		MEAN
	AGATHÉ	WA6755	KIDUR	UNIDUR	
MONTPELLIER	1.55	1.91	0.28	0.50	1.06
CASTELNAUDARY	1.73	2.01	1.07	1.12	1.48
LA BEGUDE	1.53	1.89	0.76	0.86	1.26
MAISSE	1.64	1.74	0.48	0.80	1.17
SOURS	1.64	1.83	0.63	0.89	1.25
BAZOCHES	1.65	1.70	0.38	0.63	1.09
MEAN	1.62	1.85	0.60	0.80	1.22

CONCLUSION

Several conclusions can be pointed out:

-From the comparison of tables 1 and 2, there is generally an opposite evolution of ratio neutral lipids/total lipids and of gluten elastic recovery;

-The results can suggest that the durum lipid nature, and not their quantity is able:

-to influence the expression of intrinsic quality primarily determined by proteins;

-to explain partly the fluctuation in cooking quality between cultivars according to growing location;

-Further studies on lipid-protein accumulation and interactions during ripeness are necessary.