
***PROTECTIVE EFFECT OF HULLS
Triticum aestivum ssp. spelta
AGAINST INSECT INFESTATION DURING STORAGE***

Bodroža-Solarov, M. ¹, Almaši R. ², Poslončec D. ², Filipčev B. ¹, Šimurina O. ¹

¹Institute for Food Technology, Bulevar cara Lazara 1, 21000 Novi Sad, Serbia

² Faculty of Agriculture, Dositeja Obradovića 8, 21000 Novi Sad, Serbia.

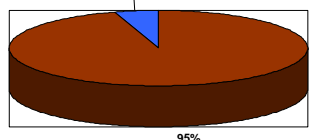
e-mail: marija.bodroza@fins.uns.ac.rs



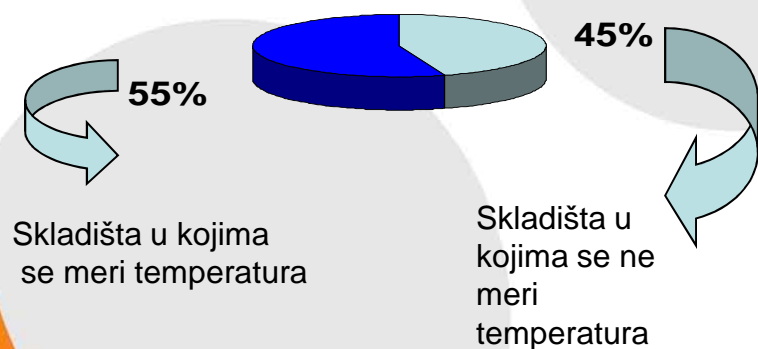
Problemi skladištenja-

Tehnologija skladištenja

2001. Međunarodna skladišta (160)



Veliki broj neuslovnih skladišta (bez sistema merenja temperature)



Srbija poseduje značajne i velike skladišne kapacitete

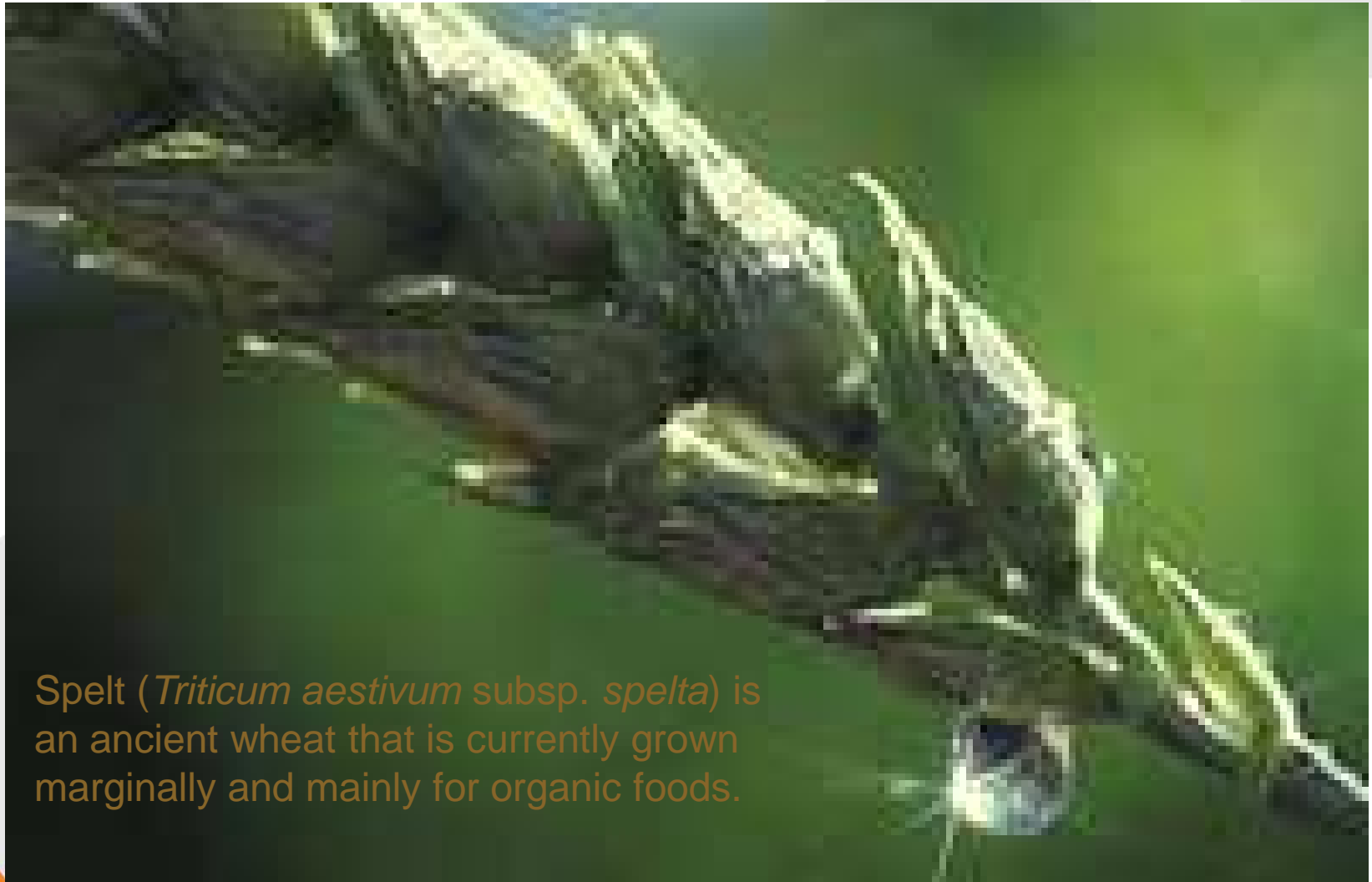
Preduzeća sa većim kapacitetom, (15- najvećih- 785.000 t) imaju uslove za razvrstavanje (> 2 usipna koša) pšenice po kvalitetu.

Lokalno samozagrevanje u siloskoj ćeliji



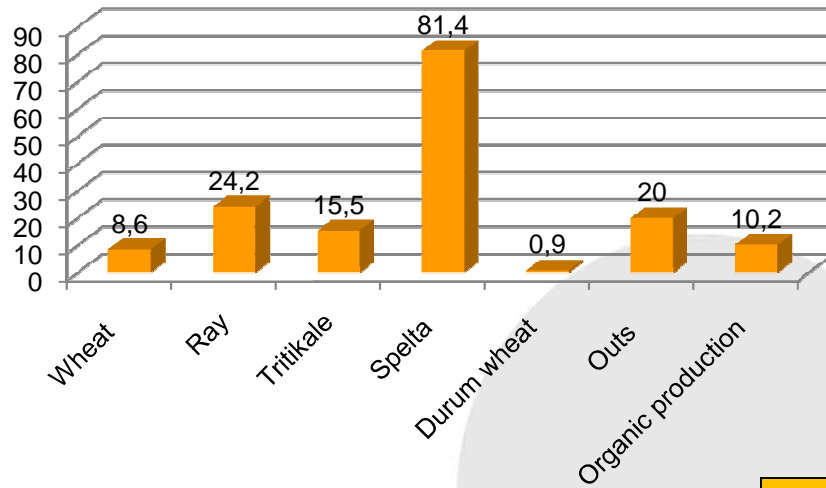
Radno mesto	SSS	VišaSS	Visoka SS
Rukovodilac silosa	67	15	23
šef laboratorije (lice zaduženo za kontrolu kvaliteta)	51	19	35

INTRODUCTION



Spelt (*Triticum aestivum* subsp. *spelta*) is an ancient wheat that is currently grown marginally and mainly for organic foods.

Percentage in organic cereal production in 2007.g. (%)



Austria - (ha)

Cereals	Organic production 2007 g.(ha)	Percentage in organic production 2007.g. (%)
<i>Wheat</i>	23249	8,6
<i>Ray</i>	11281	24,2
<i>Triticale</i>	6011	15,5
<i>Spelta</i>	5059	81,4
<i>Durum wheat</i>	132	0,9
<i>Outs</i>	6221	20
CEREALS	62358	10,2

Global seed- Čurug (2010)
Velvet farm
800 ha

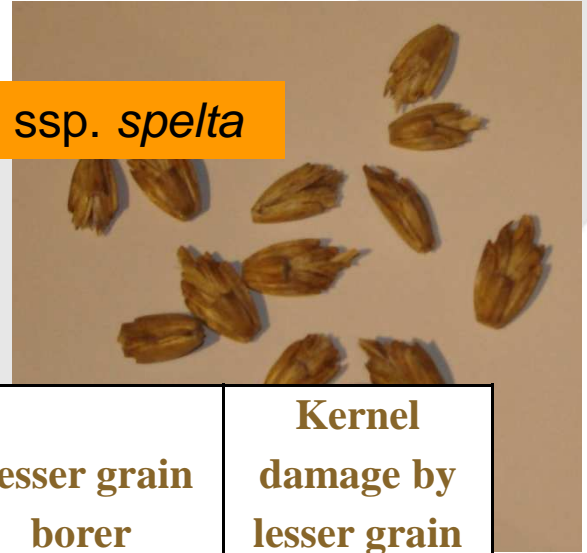
Organic Food Production

MATERIAL AND METHODS

- Hulled and dehulled spelt wheat samples were infested with rice weevils (*Sitophilus oryzae* L.) and lesser grain borer (*Rhyzopertha dominica* F.) and stored for up to 60 days at room temperature.
- test weight of hulled and dehulled spelt was determined by a Schopper scale.
- Samples were analyzed by standard ICC methods for: moisture content of cereals and crude protein.
- Statistical analysis was performed by analysis of variance (Statistica 9.1,) and Fisher's least significance difference (LSD) was used to compare means.

RESULTS

Triticum aestivum ssp. *spelta*



Infestation (n) and kernel damage (%) by rice weevil and lesser grain borer *after 60 days of storage*.

Treatment	Cultivars	Rice weevil infestation (n)	Kernel damage by rice weevil (%)	Lesser grain borer infestation (n)	Kernel damage by lesser grain borer (%)
Hulled spelt grain	Nirvana	0 ± 0,00 a	0 ± 0,00 a	14,6 ± 1,61a	5,4 ± 1,41b
	Ekö 10	0 ± 0,00 a	0 ± 0,00 a	14,4 ± 1,93a	4,2 ± 0,98 a
	Ostro	0 ± 0,00 a	0 ± 0,00 a	13,6 ± 1,54a	5,9 ± 1,61 b
Dehulled spelt grain	Nirvana	134,8±17,61 b	9,3 ± 0,91 b	36,0 ± 5,54b	13,4 ± 1,35 c
	Ekö 10	156,8±23,61 b	8,9 ± 1,32 b	49,4± 4,23c	12,9 ± 0,45 c
	Ostro	133,0±19,23 b	9,6 ± 1,45 b	49,8 ± 5,45c	15,9 ± 1,64 d

Triticum aestivum ssp. *spelta*



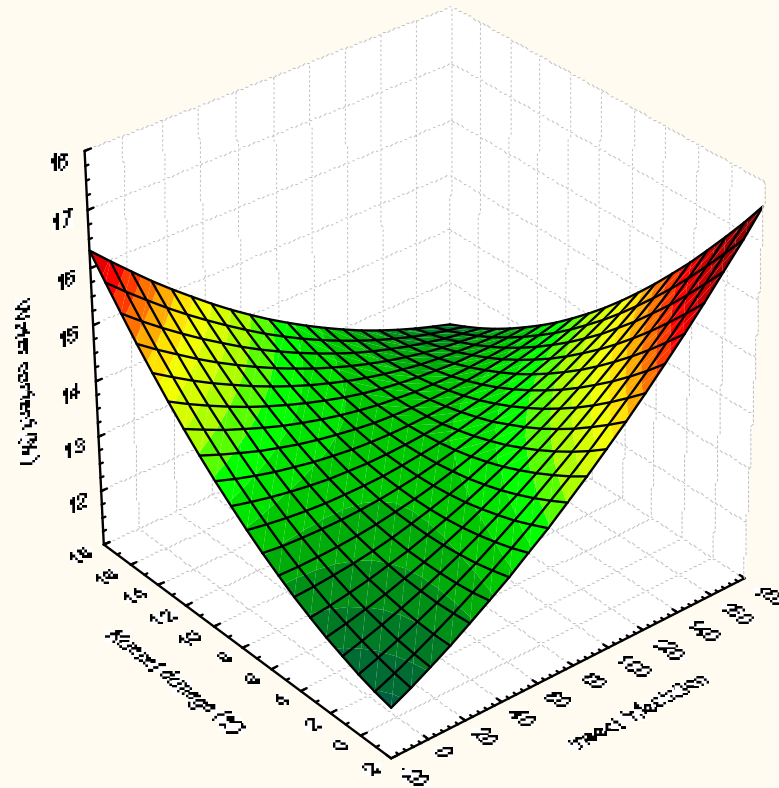
Mean values and standard deviations for test weight of hulled and dehulled *Tr. aestivum* ssp. *spelta* after 60 day of insect infestation

<i>Test weight</i> (kg/hl)	Spelt varieties					
	Hulled spelt grain			Dehulled spelt grain		
	Nirvana	Ekö 10	Ostro	Nirvana	Ekö 10	Ostro
Controls	58.5±3.8a	56.6±4.6a	54.8±2.8a	75.7 ±3.2a	77.3±5.5a	76.4±3.6a
<i>Sitophilus oryzae</i> infestation	58,5±4,2a	56,2±4,8a	55,4±3.8a	70.6 ± 4.8b	71.3±2.8b	71.4±4.6b
<i>Rhizopertha dominica</i> infestation	52,6±4,9b	50,6±3,2b	50,4±6,7b	65.8 ± 3.7c	66.3±4.5c	65.4±3.3c

Triticum aestivum ssp. spelta

Effect of insect infestation and kernel damage on the grain moisture content

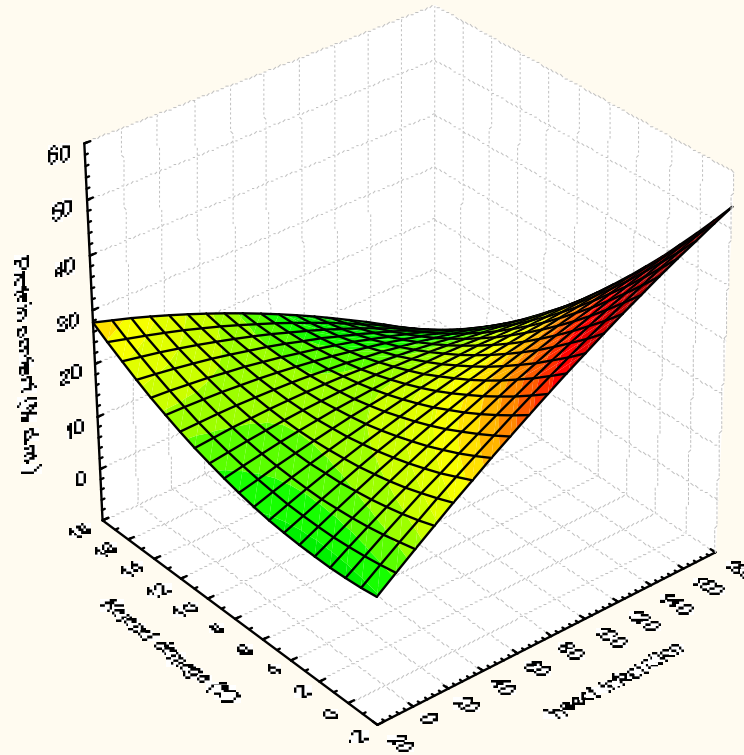
3D Surface Plot of Water content (%) against Insect infestation and Kerenel damage (%)
Water content (%) = $12,3335+0,0141*x+0,0496*y+5,8718E-5*x*x-0,0024*x*y+0,0076*y*y$



- > 17
- < 17
- < 16
- < 15
- < 14
- < 13
- < 12

Effect of insect infestation and kernel damage on the grain protein content

3D Surface Plot of Protein content (% d.m.) against Insect infestation and Kereneel damage (%)
Protein content (% d.m.) = $17,4841+0,211*x-0,545*y-0,0003*x*x-0,0177*x*y+0,0555*y*y$



- > 50
- < 48
- < 38
- < 28
- < 18
- < 8
- < -2

CONCLUSION

- Rice weevils do not feed and reproduce when the kernels are hulled. The hull protects kernels from the attack of rice weevils but not from lesser grain borers.
- Lesser grain borers normally develop both on kernels and spikes of spelt wheat. The results show that the impossibility of rice weevil nutrition resulted from the physical impossibility of nutrition and not from the repellent spike effect.
- The number of offspring of lesser grain borers is significantly smaller than the number of offspring of rice weevils on kernels.
- Physico-chemical grain quality parameters declined with increased damaged caused by the insects. The test weight was negatively correlated to the insect infestation level whereas the moisture content was positively correlated to the insect infestation level.

Acknowledgement

The authors gratefully acknowledge the financial support from the Ministry of Science and Technological Development of the Republic of Serbia (Project TR 20066).



***THANK YOU FOR
ATTENTION !***

Organic Food Processing

ERROR: undefined
OFFENDING COMMAND: Bodroza-Solarov

STACK:

```
(9)  
/Title  
( )  
/Subject  
(D:20101203150702+01'00')  
/ModDate  
( )  
/Keywords  
(PDFCreator Version 0.9.5)  
/Creator  
(D:20101203150702+01'00')  
/CreationDate  
(dusica.ivanov)  
/Author  
-mark-
```