



Effect of different sources of soluble and insoluble dietary fibers on starch digestibility

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Objective

- To evaluate the influence of different types and concentrations of dietary fibers on starch digestibility.
- To investigate the effect of moisture content on starch digestibility.



Materials:

- Hard wheat flour
- Whole meals : wheat, barley, rye and oats.
- Cellulose



- **Experiment #1**
- Flour was mixed in the farinograph at the water absorption of the composite flour
- The dough was heated in the oven to 95C, held at this temperature for 10 min, cooled to room temperature and freeze dried.
- **Experiment #2:**
- Flour was mixed in the MVAG at 8% concentration, held for 1 min @ 25C, heated to 95C (@ 10C /min), held at this temperature for 3min, then cooled to 25C (@ 10C /min and held @ 25C for 5min), and freeze dried.



Measurements

- Total starch (TS)
- Rapidly digestible starch (RDS)
- Slowly digestible starch (SDS)
- Structure characteristics by SEM and CLSM



RESULTS



Effect of different whole meals on starch digestibility

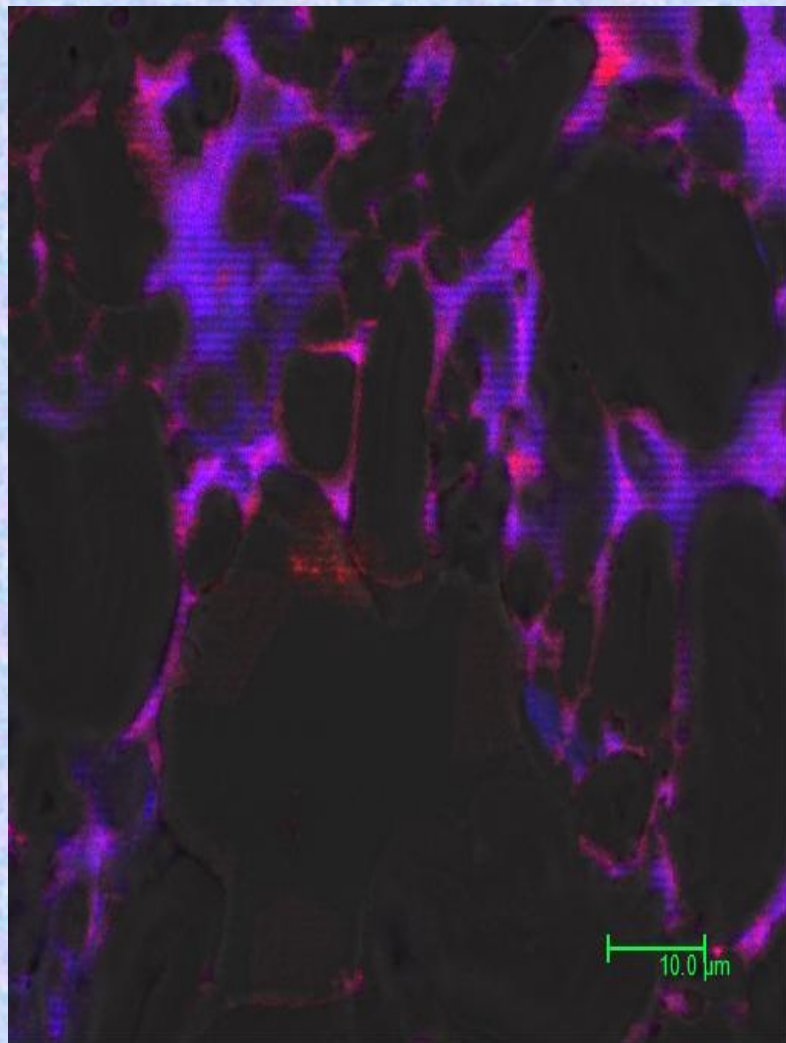


SDS, RDS and RS calculated as percentage of total starch in the freeze-dried oven-treated dough

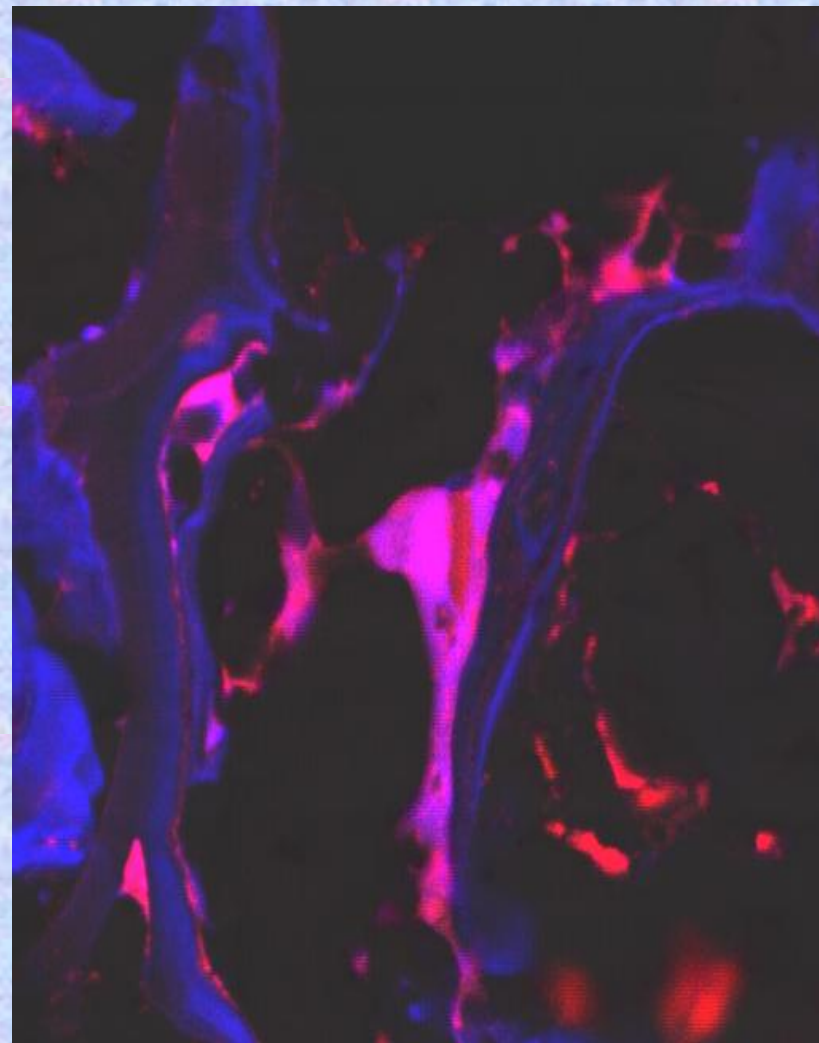
Sample	SDS (%)	RDS (%)	RS (%)
Control	45.9 ^a	42.1 ^a	11.3 ^a
STD	2.0	0.0	
30% Rye	54.1 ^d	45.5 ^c	0.4 ^c
STD	1.2	0.5	
30% Oat	51.3 ^c	44.2 ^c	4.5 ^d
STD	0.5	0.6	
30% barley	50.5 ^c	42.3 ^a	7.2 ^d
STD	2.5	0.0	
30% wheat	44.7 ^a	44.9 ^c	10.3 ^a
STD	0.4	0.8	
Cellulose	45.4	43.0	11.6



Highest increase in SDS with rye incorporation

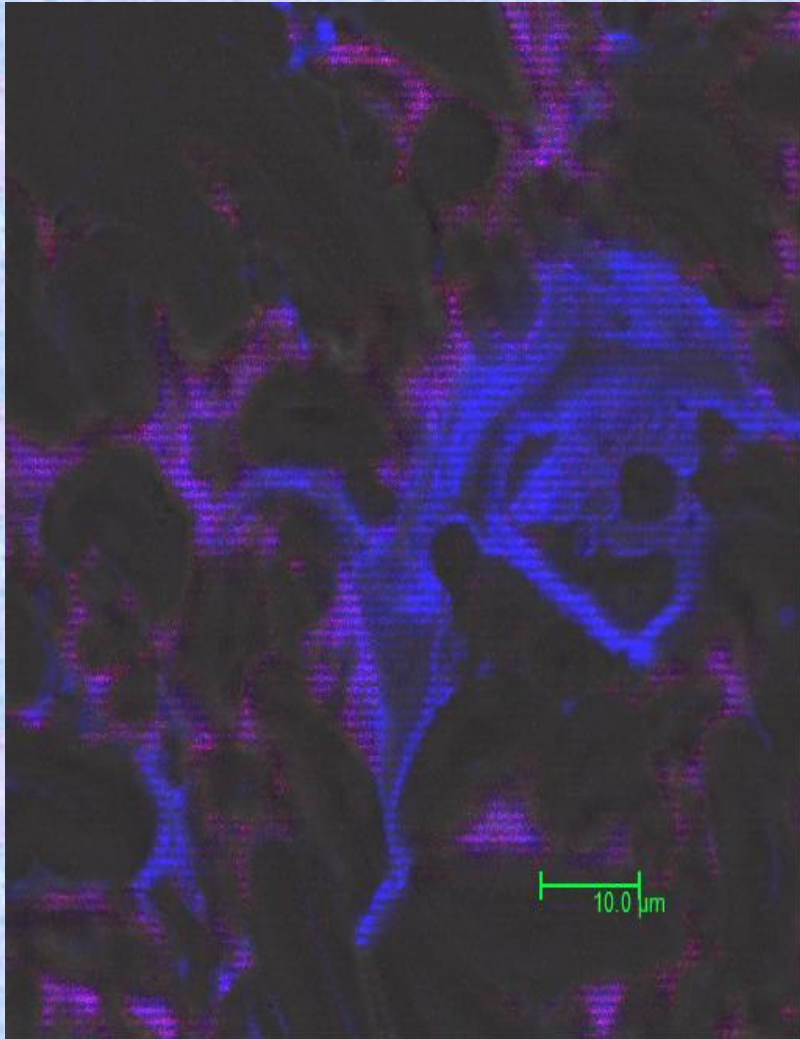


Control SDS = 45.9% 2.0 30%

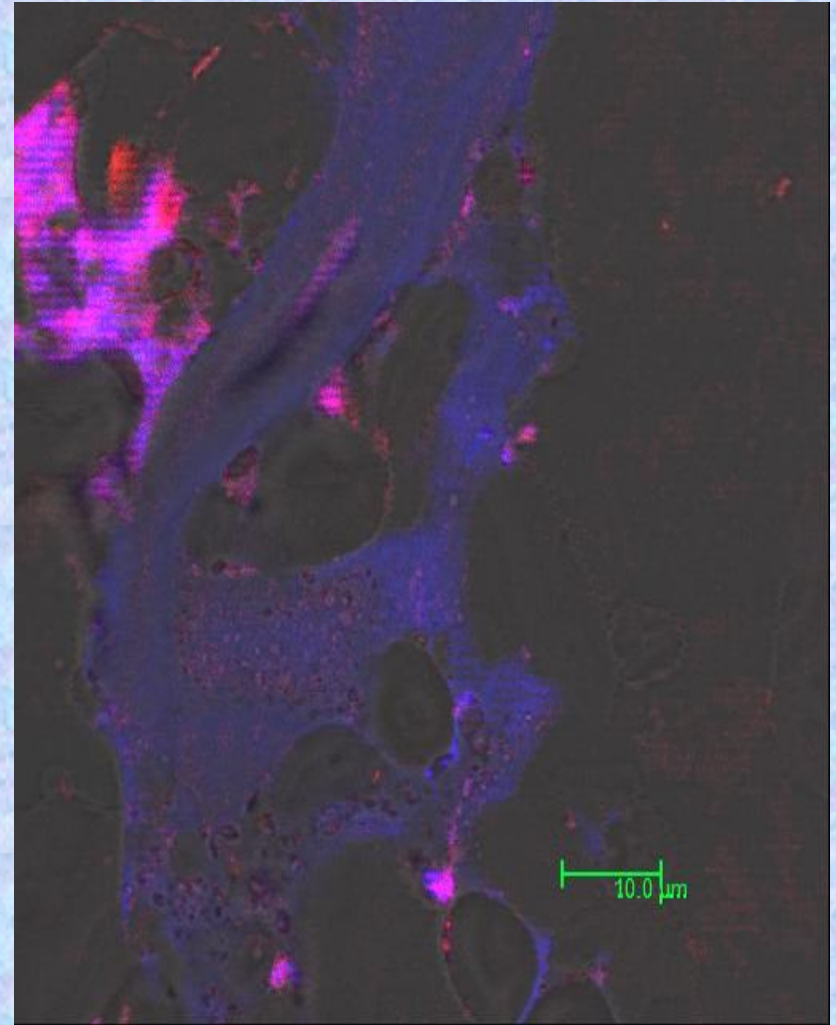


Rye SDS = 54.1% 1.3

Oat resulted in the second highest level of SDS, followed by Barley

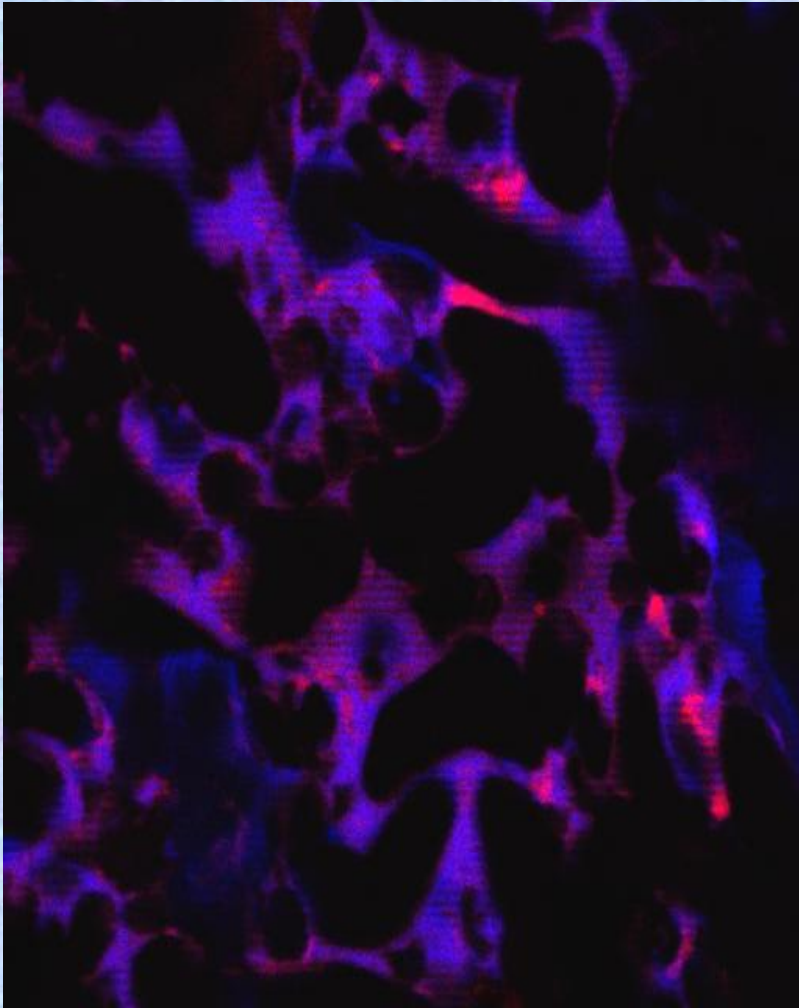


30% oat SDS= 51.3% 0.5

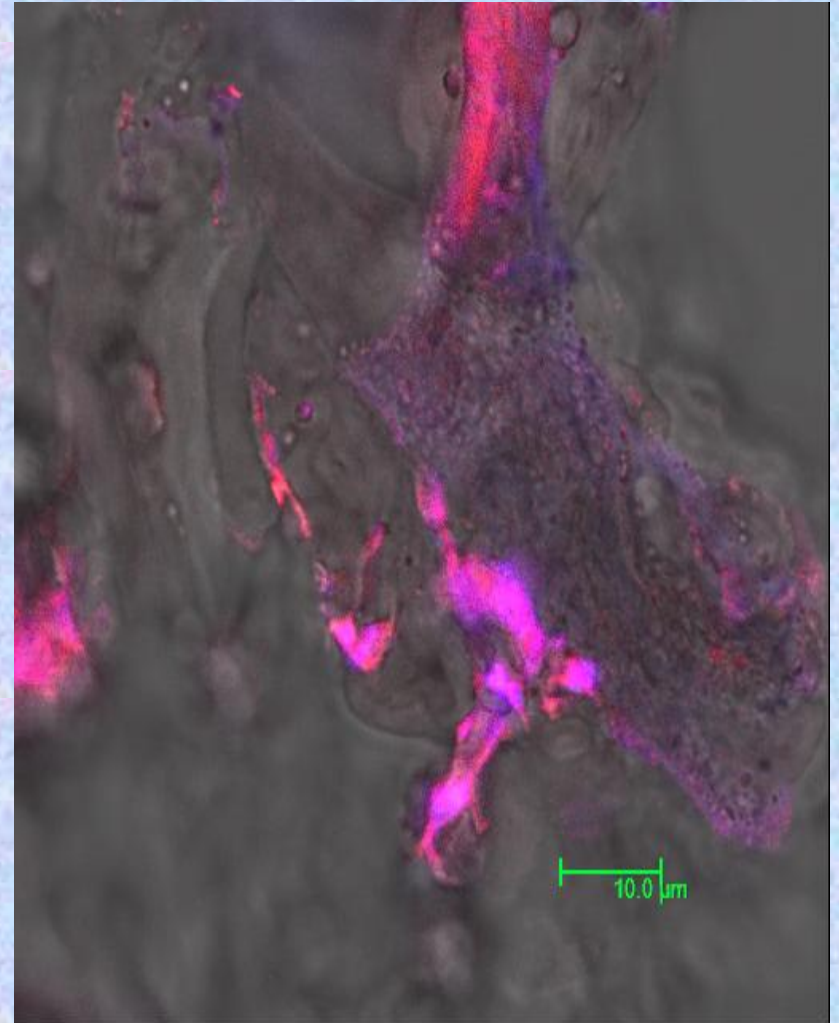


30% Barley SDS=50.5% 2.5

Wheat whole meal and Cellulose resulted in the lowest % of SDS



30% Wheat SDS= 44.8% 0.4



15% Cellulose SDS = 45.4 0.4

Effect of moisture content on starch digestibility

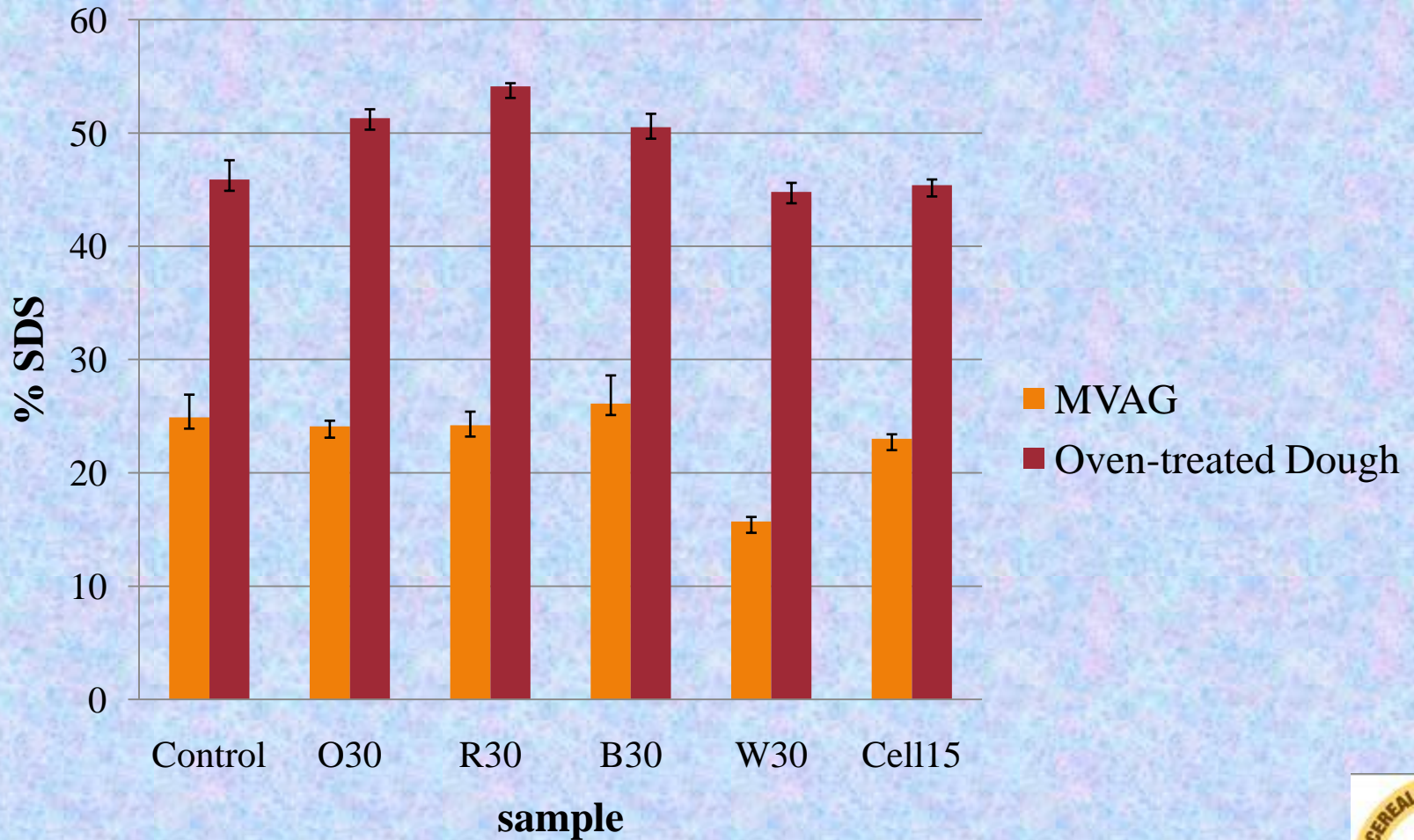


SDS, RDS and RS calculated as percentage of total starch in the freeze-dried gel produced by the MVAG

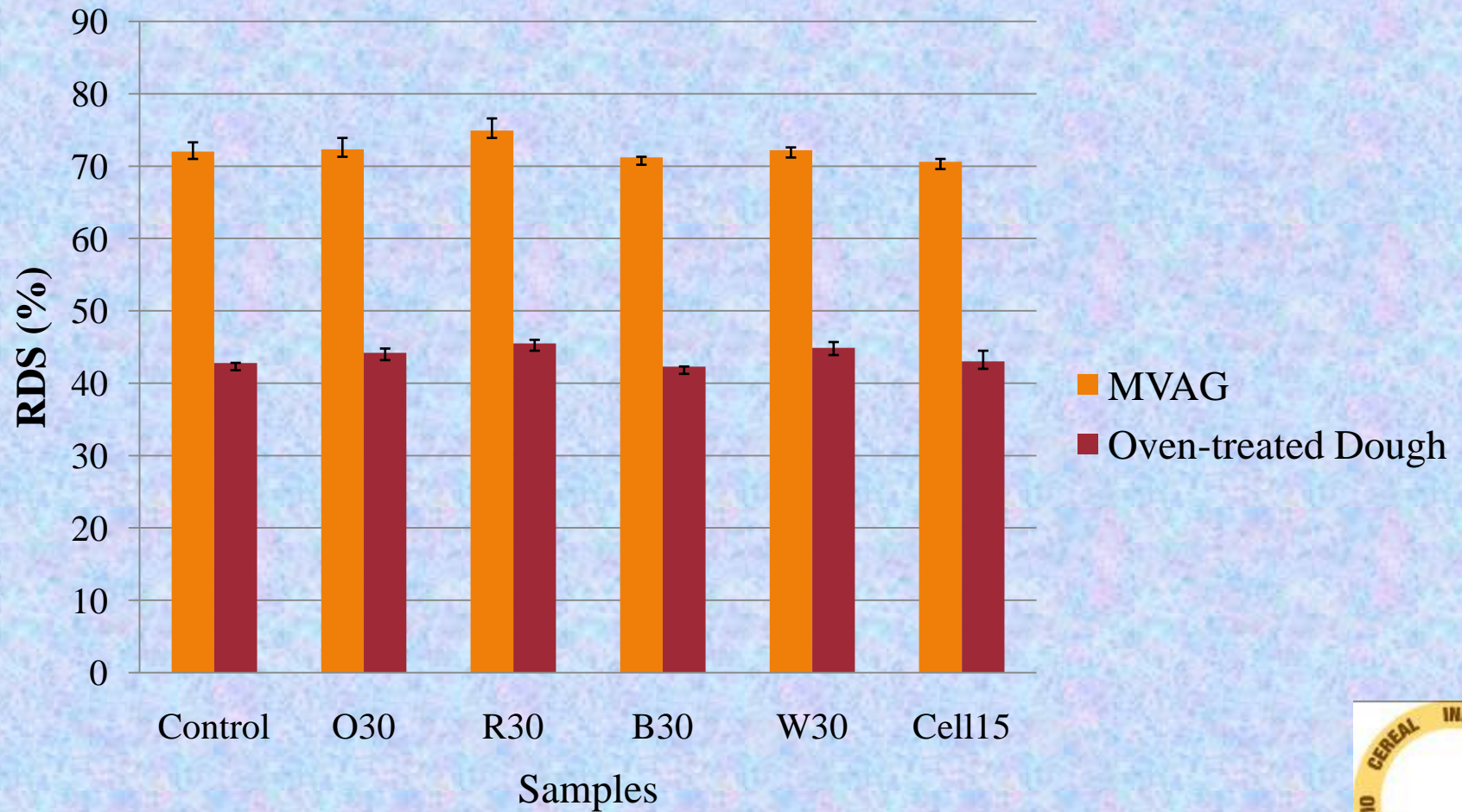
Sample	SDS (%)	RDS (%)	RS (%)
Control	24.9	71.9	3.1
STD	1.7	1.3	
30% barley	26.1	71.2	2.7
STD	1.2	0.1	
30% Rye	24.2	74.9	0.9
STD	0.3	1.7	
30% Oat	24.1	72.3	3.6
STD	0.8	1.6	
30% wheat	15.7*	72.3	12.1*
STD	0.8	0.4	
Cellulose	22.4	68.7	8.9



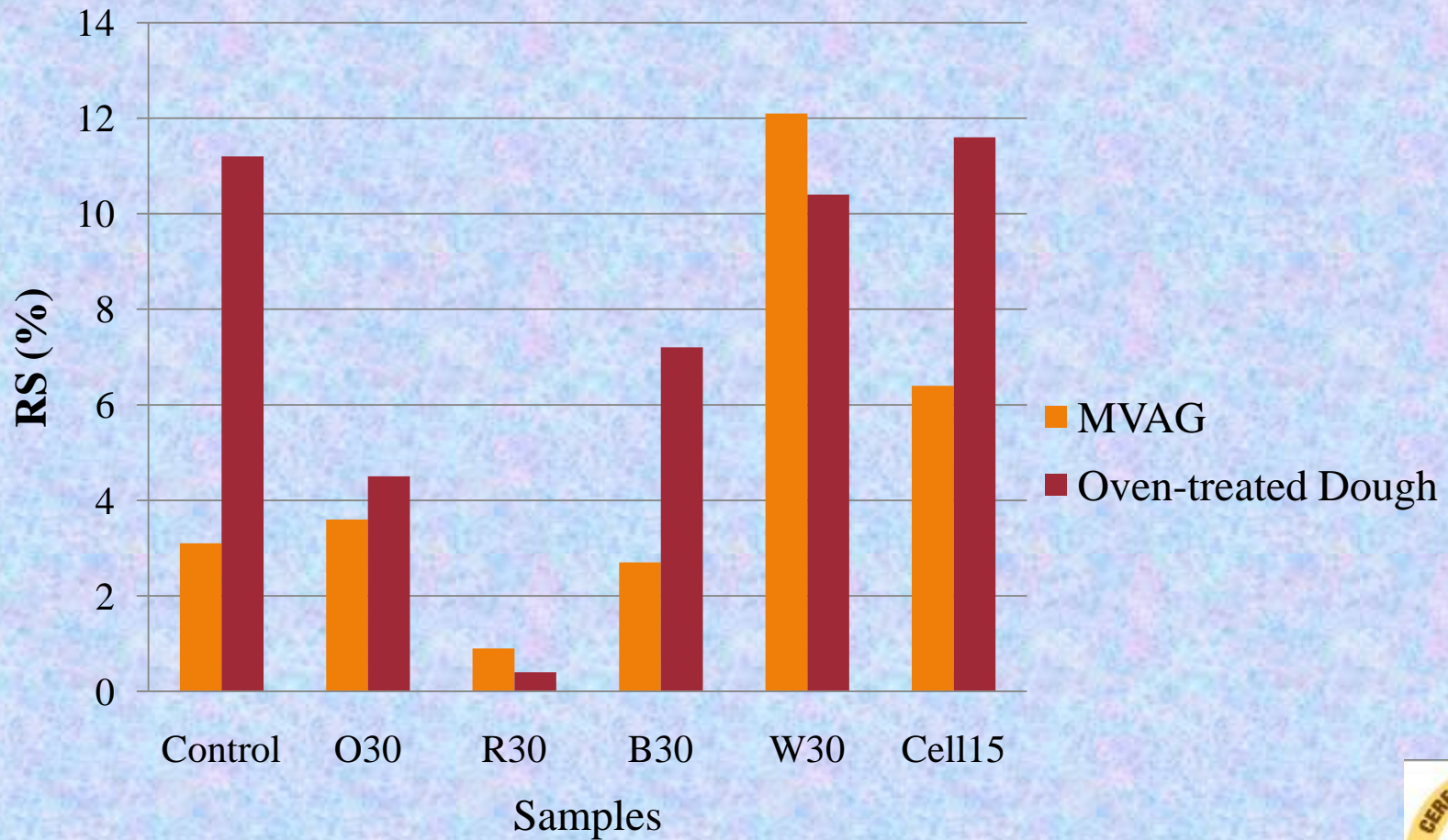
SDS as % of TS



RDS as % of TS



RS as % of TS



Conclusion

- Different whole meals have different effect on starch digestibility.
- Moisture content affected starch digestibility.



Acknowledgement

- Dr. Neelam Dhull
- Lida Asharfi
- Igor Guzar



The background features a light blue grid pattern. At the top, there are several wavy, overlapping lines in shades of purple, blue, and red. The text "Thank you" is centered in a black, sans-serif font.

Thank you

Chemical composition of whole meals from different cereals

	HRS ¹ wheat	Rye ²	Barley ³	Oat ⁴
Protein (N*6.25)	16.8	9.5	11.7	12.8
Fat	2.1	2.4	1.5	9.5
TDF	12.5	16.5	6.6	19.3-22.6
Ash	1.7	1.9	2.5	2.0
Starch	62.4	64.6	57.6-59.5	43-61
TDF	12.5	16.5		
IDF	10.8		5.9	
SDF	1.7	4-5.2	3-7	3.9-6.8
*B-glucan	<1	1.5-2.5	5-11	3-8.5

¹ Abdelaal et al 1995, ²bengtsson and Aman 1990, ^{3,4}Kulp and Ponte, * Tiwari and Cummins 2009

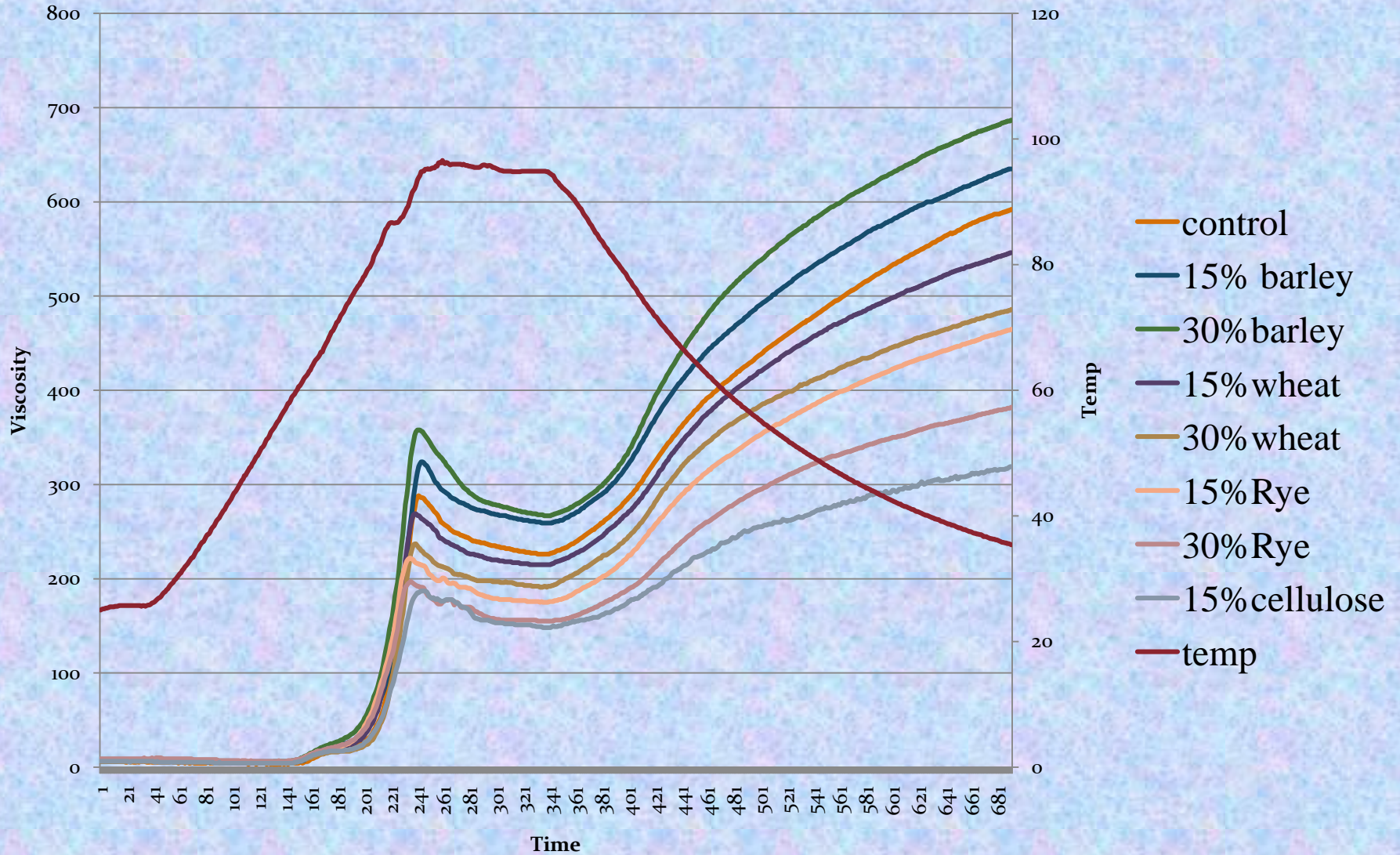
Statistic Analysis Oven-treated dough

Sample	SDS	RDS	RS
Control	45.89 ^a	42.82 ^a	11.29 ^a
barley30%	50.52 ^{bc}	42.27 ^a	7.21 ^d
Rye30%	54.11 ^d	45.47 ^c	0.42 ^c
oat 30%	51.28 ^{bc}	44.19 ^c	4.53 ^d
wheat 30%	44.76 ^a	44.87 ^c	10.36 ^a

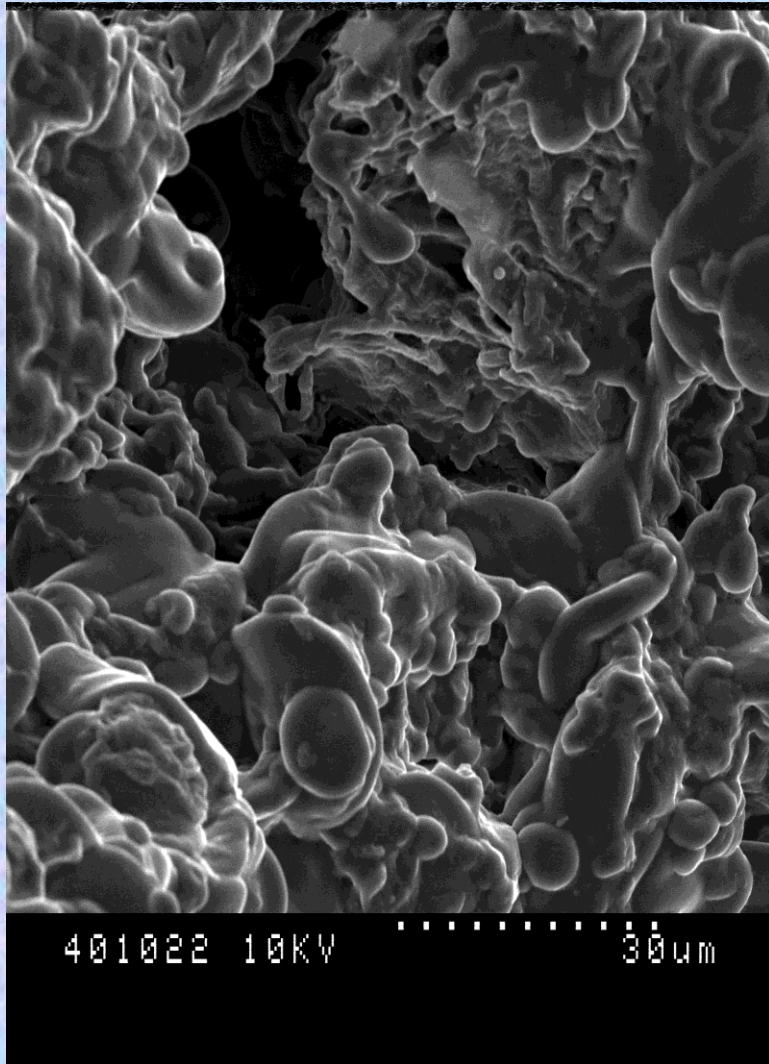
Statistic Analysis Gel

Sample	SDS	RDS	RS
Control	24.88b	71.99a	3.13a
Wheat30%	15.69a	72.24a	12.07b
Barley30%	26.14b	71.18a	2.69a
Rye 30%	24.19b	74.88a	0.94a
Oat 30%	24.14b	72.30a	3.56a

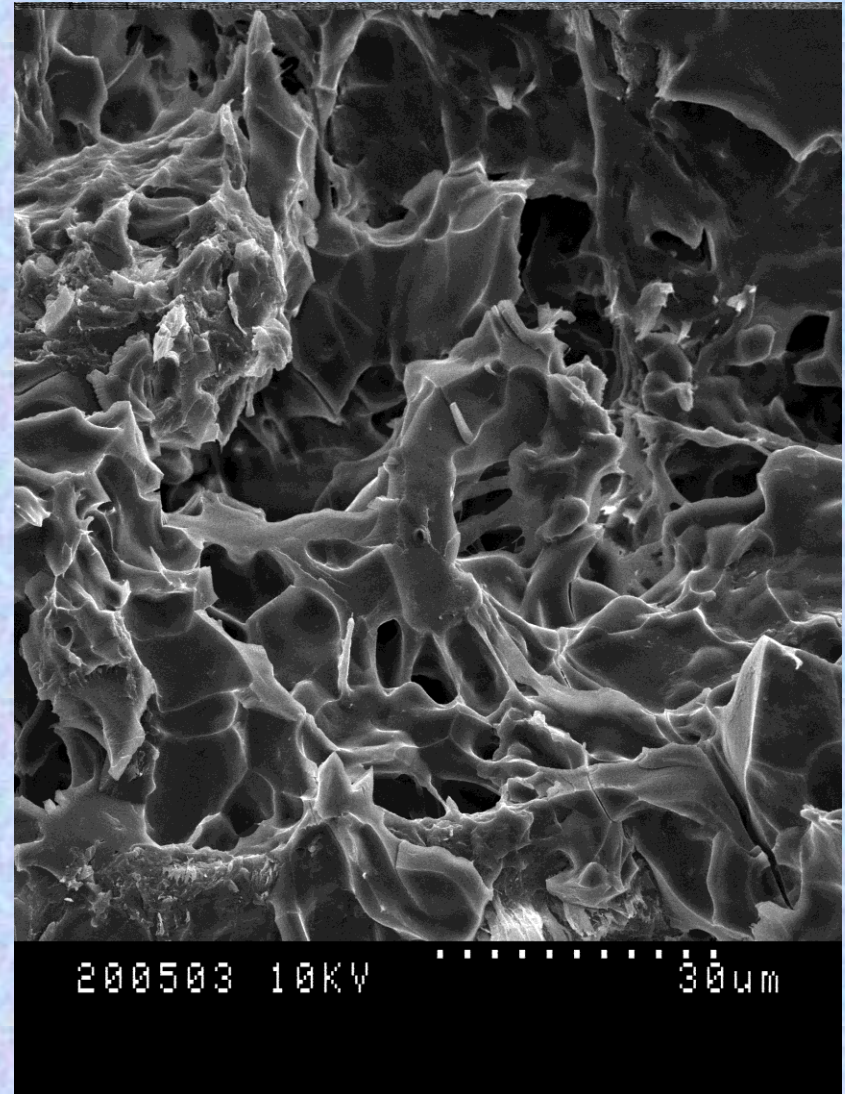
15% and 30% replacements (no oat)



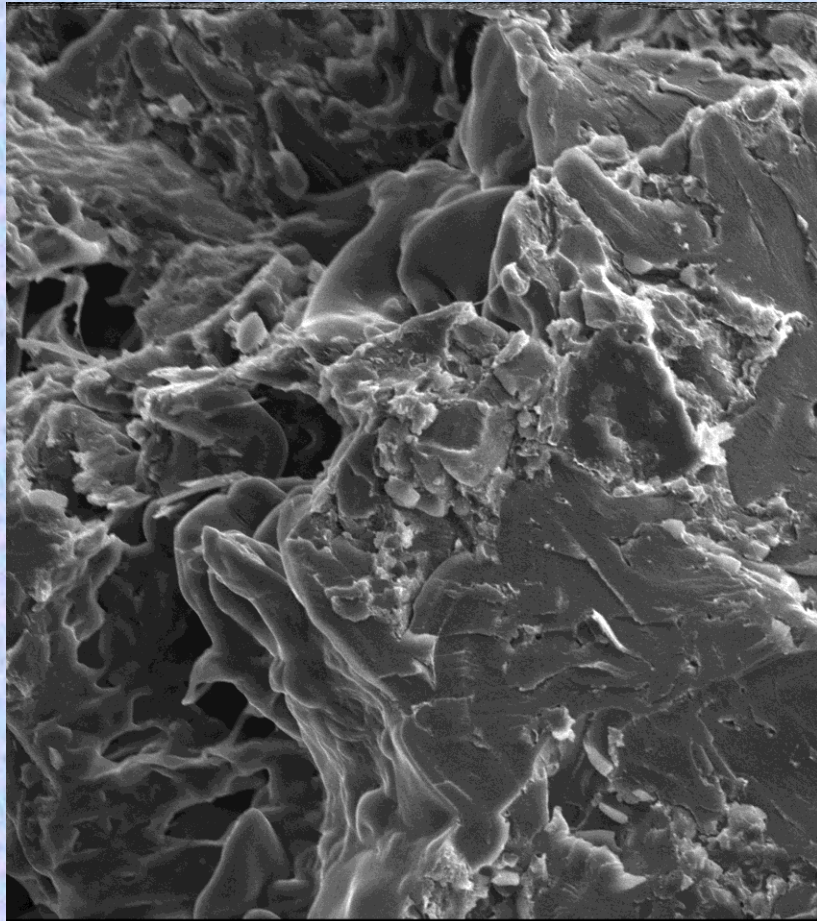
Control



15% Cellulose

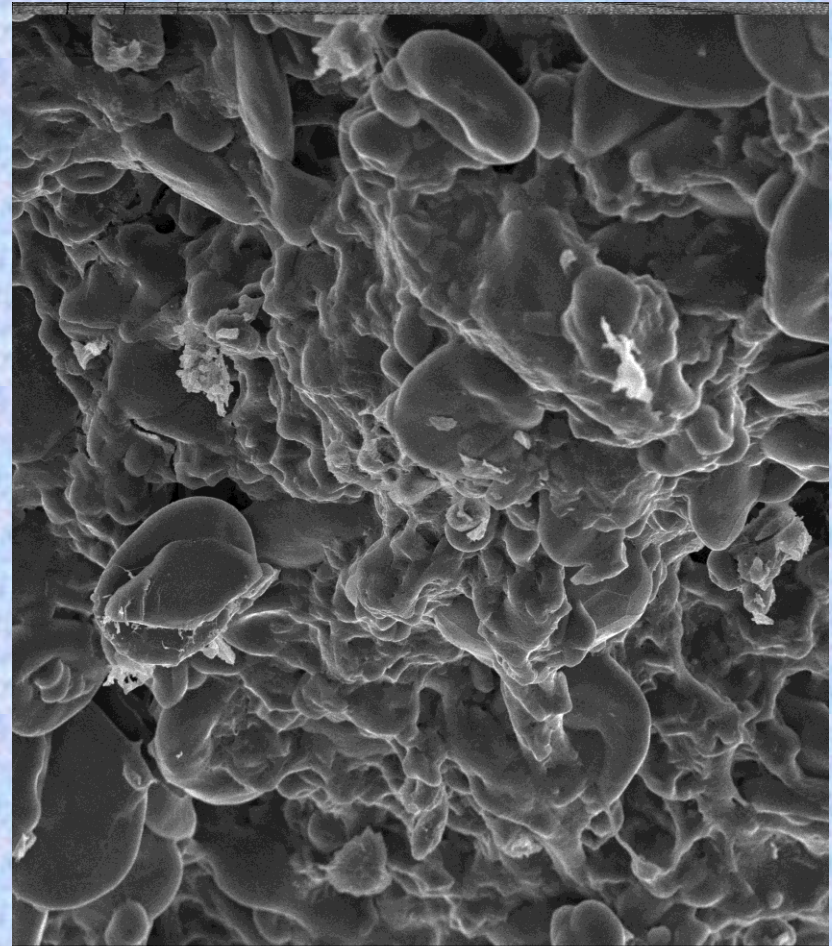


barley



401047 10KV 30um

oat



000011 10KV 30um

Rye

