



Composite cross populations keep up with winter wheat varieties

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Context and purpose

Context and purpose of the trial is similar to Cobra project descriptions – in particular in this case the value of 4 CCP's is tested in reference to 4 local varieties of winter wheat. In Table 1 these 8 objects are listed with their origin.

Characteristics of the trial field plot

The trial field plot is situated at the organic experimental farm of Inagro in Beitem, Belgium. The soil texture is sandy loam. The field plot was sampled on the 19th of February 2014. The soil characteristics for the sample of 0 – 30 cm are shown in Table 2. The 8 objects were assessed in a randomized block design with 4 repetitions (each plot is approx. 2,3 x 12,0 meters).

Growing conditions and course of the trial

The trial was sown on the 25th of November 2013 in rather wet soil conditions. Sowing density was 450 s/m². The crop before was carrots. Emergence was low for all objects (42-51%)

because of the very wet conditions after sowing. The winter was exceptionally warm with only a few occasions of slight frost, so in springtime the crop was well developed after all.

At the beginning of March a more dry period started which abled to spread 25 t/ha cattle slurry at the 20th of March. On the 18th and 26th March the crop was harrowed with a tine harrow. The warm weather led to a good early crop development, however growth was rapidly restrained by a severe pressure of yellow rust beginning in the end of March. Yellow rust infection was present in more or less extent on all objects, for practically the rest of the growing season. In June an infection of septoria leaf blotch was observed on all objects. In July there was some minimal lodging. On the 25th of July the crop was harvested at an average yield of 6,5 t/ha for the 4 varieties and 6,2 t/ha for the CCP's.

Note that the analysis of protein content and the baking value of the objects is still in progress. When these results are available, a definitive report will be made.

The varieties and CCP's were similar in their rate of emergence and crop development. Also the ground cover, rate of tillering and weed suppression was not significantly different between these two groups. Eye catching still was the large heterogeneity among individual plants in the CCP's regarding height, color, awns, ...

Discussion of the objects

Winterwheat - varieties

The 4 varieties count as reference varieties in organic baking-quality wheat in the North of France. Renan is an old variety (1989) that still holds as the standard variety for organic baking-quality wheat in this region. Lukullus and Midas are relatively new (2008) but have proven to be varieties with a good trade-off between baking quality and yield. Skerzoo is a new variety of 2012 produced by INRA with the purpose of use in organic agriculture and is supposed to be tolerant to most diseases.

As a group these varieties were relatively dark-colored, with short straw and not susceptible to lodging. On the 10th of April and the 7th of May the varieties were mildly infected with yellow rust. The pressure persisted and on the 10th of June this evolved into a severe infection. Grain harvest was quite dry (14,5-14,8%) and straw was short (82-95 cm). Further details on the development and yield of the varieties can be found in the tables and conclusion.

Winterwheat – composite cross populations

The 4 CCP's, originary to the Organic Research Centre in 2001, were obtained from the partners in the Cobra project. Two are Europe-circulating CCP's since 2008, two are grown in Germany since 2005. Their history is in Table 1.

The crops of the 4 CCP's were, in comparison to the varieties, relatively light-colored with on average longer straw and more susceptible to lodging. On the 10th of April and the 7th of May the CCP's were moderately infected with yellow rust, but contrary to the varieties the



pressure did not persist that much in June. Grain harvest was more humid (15,4-15,8%), probably as a result of a more heterogenic ripening. The average straw length of the CCP's is significantly higher (101-108 cm). Differences between the CCP's were minimal.

CCC D13 (Germany) and **CCC UK13** (United Kingdom)

These are circulating CCP's that were harvested in Germany and the UK in 2013. Since 2008 these CCP's were grown in a different European country yearly. Because of this different history one would expect to see some differences between the populations as a result of natural selection. In this trial D13 had a lower yield (non-significant), together with somewhat drier grains (15,4 compared to 15,8%), a higher weight per hectoliter (79,5 compared to 78,1 kg) and on average longer straw (108 compared to 101 cm).

CC D13 CAI en **CC D13 OAI** (Germany)

These circulating CCP's are grown in Germany since 2005 in respectively conventional and organic production ways. In this trial these populations were practically identical with no significant differences.

Conclusion

Despite the large pressure of yellow rust the winter wheat varieties yielded moderately well (6,5 t/ha). Renan is the standard variety for baking wheat in North-France, but did not convince in this trial. Renan had an airy crop, moderate yield and only sufficient weight per hectoliter. Midas made a robust crop and had the largest yield, despite its disease susceptibility. Lukullus is comparable to Midas and despite a bad emergence it had a good yield and highest weight per hectoliter. Skerzso combines a good tolerance to diseases with a robust crop and good yield results.

In this exploratory trial, the winter wheat CCP's had a comparable yield (6,2 t/ha) as the reference varieties. Yellow rust susceptibility was a defining factor this year. Although both CCP's and varieties suffered from the pressure, the CCP's were able to keep up longer. It was with the varieties that in June the largest damage of yellow rust was seen. In the springtime similar observations were made in other European countries. In trials comparing CCP's (Cobra) with local varieties, CCP's were most of the time less damaged.

Some characteristics of the CCP's are now clear: a high crop with large heterogeneity, possibly susceptible to lodging and ripening late. Among the CCP's there were only minor differences. So the effect of environment on the genetical evolution of the population is (still) limited. This points to a rather slow adjustment to their environment, but it also proves that they are stable populations rather than just a changing mixture.

Table 1: The 8 objects in the trial with name and origin

object	Naam	Herkomst	bio/ncb
1	CCCD13	cycling UK08-DK09-TUM10-HU11-NL12-D13	bio
2	CCCUK13	cycling HU08-NL09-D10-CH11-F12-UK13	bio
3	CCD13CAI	QY-populatie Duitsland conventioneel	ncb
4	CCD13OAI	QY-populatie Duitsland biologisch	bio
5	Lukullus	Biocer	bio
6	Midas	Biocer	bio
7	Renan	Biocer	bio
8	Skerzzo	Biocer	bio

Table 2: The characteristics of the soil sample of the trial field plot

Substance	Unit
Ca	144 mg/100g
P	21,7 mg/100g
K	19,6 mg/100g
Mg	20,1 mg/100g
Na	1,74 mg/100g
S	1,78 mg/100g
Organic carbon	1,54 % on dry sample
pH	5,81
Texture	sandy loam

Table 3: Name, emergence (plants/m² and %), crop development (well/bad), soil cover (well/bad) and amount of tillering (well/bad) of the objects

Naam	Planten/ m ²	Opkomst (%)		Gewasontwikkeling				Grondbedekking Uitstoeling			
		8/01/2014		5/mrt	9/mei	9/mei	9/mei	9/mei	9/mei		
CCCD13	220	49	b	5,3	ab	6,6	bc	6,6	a	6,1	b
CCCUK13	201	45	c	4,5	ab	6,4	bc	6,6	a	6,3	ab
CCD13CAI	222	49	ab	5,3	ab	6,8	b	6,6	a	6,1	b
CCD13OAI	231	51	ab	5,5	a	6,9	ab	6,8	a	6,4	ab
Lukullus	187	42	c	3,3	cd	6,5	bc	6,4	a	6,4	ab
Midas	241	54	a	4,0	bc	7,4	a	6,8	a	6,3	ab
Renan	187	42	c	2,9	d	6,1	c	6,5	a	6,6	a
Skerzzo	223	50	ab	5,4	a	5,4	d	6,1	a	6,6	a
Gemiddelde	214	48		4,5		6,5		6,5		6,3	
		Quotering		9= zeer goed				< 10 %		zeer goed	
				1= zeer slecht				> 90 %		zeer slecht	

Table 4: Name, damage of yellow rust (no/much) on 3 dates and damage of septoria leaf blotch (no/much)

Naam	Gele roest				Septoria			
	10/apr		7/mei		10/jun		10/jun	
CCCD13	6,6	bc	5,8	d	6,5	a	6,3	abc
CCCUK13	6,5	c	6,1	d	6,5	a	6,5	ab
CCD13CAI	6,4	c	5,9	d	6,5	a	6,5	ab
CCD13OAI	6,1	c	5,9	d	6,3	a	6,3	abc
Lukullus	7,4	a	7,3	c	4,8	b	6,0	bc
Midas	7,1	ab	7,8	b	5,3	b	5,7	c
Renan	7,3	a	7,1	c	6,3	a	6,5	ab
Skorzoo	7,4	a	8,3	a	6,5	a	7,0	a
Gemiddelde	6,8		6,8		6,1		6,4	
Quotering	9= geen 1=zeer veel		geen zeer veel		geen zeer veel		geen zeer veel	

Table 5: Name, grain yield (kg/ha), grain humidity (%), weight per hectolitre (kg), length of straw (cm) and amount of lodging (no/much)

Ras	Korrelopbrengst (15% vocht)		% vocht		Hectoliter-gewicht		Strolengte		Legering			
	kg/ha		%		kg		cm		17/jul	25/jul		
CCCD13	6056	ab	15,4	b	79,5	b	108	a	7,4	bc	6,8	c
CCCUK13	6527	ab	15,8	a	78,1	cd	101	b	7,2	c	6,7	c
CCD13CAI	6386	ab	15,6	ab	78,2	cd	104	ab	7,7	bc	7,1	bc
CCD13OAI	5831	b	15,9	a	78,3	cd	105	ab	6,9	c	7,1	bc
Lukullus	6363	ab	14,8	c	80,7	a	92	c	8,8	a	8,8	a
Midas	6908	a	14,5	c	78,8	bc	95	c	9,0	a	7,9	ab
Renan	6338	ab	14,5	c	76,4	e	82	d	8,3	ab	8,0	ab
Skorzoo	6655	ab	14,7	c	77,9	d	83	d	9,0	a	8,9	a
Gemiddelde	6383		15,2		78,5		96		8,0		7,7	
Quotering			9=	geen			zeer goed		zeer goed		zeer goed	
			1=	zeer veel			zeer slecht		zeer slecht		zeer slecht	