Performance of winter wheat CCP's in comparison to reference varieties in organic field trials in Belgium

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Composite cross populations of winter wheat were tested in field trials at the organic farm of Inagro in Beitem (BE) during the growing seasons 2013-2014 and 2014-2015. Up to 9 CCP's and 4 commercial varieties were assessed. The results confirm that these winter wheat CCP's produce resilient crops with overall similar performance as varieties.

Material and methods

The organic farm of Inagro is located in Beitem, Belgium which has a moderate maritime climate. The sandy loam soil can be considered as fertile without strong limitations. The trial was set up as a randomized block design with 4 replicate blocks with a net plot size of 20 m².

The CCP seed samples originated at the University of Kassel (D; 9 CCP's) and the Organic Research Centre (UK; 1 CCP). They were created in the UK by the ORC in the year 2001. Some CCP's have a smaller parental basis (OQ, OY) and all have different histories since 2001. As a reference, 4 winter wheat varieties were included of which organic seed was available. These are considered as local standard varieties for organic baking quality. The objects were scored or measured for traits such as early growth vigour, weed suppression, disease susceptibility, yield and yield quality at various times during the growing season.

Results and discussion

Although the large heterogeneity among plants in the CCP plots was apparent, among the different CCP objects the visual appearance was very similar and none of the assessed traits showed significant differences inside of this group. This in contrast to the variety group where strengths and weaknesses among objects were significant and recurring. In both years emergence rate, amount of tillering, early crop development and weed suppression did not significantly differ between the CCP group and the variety group. The CCP's were remarkably taller than the varieties but lodging did not occur thanks to favorable weather conditions. In terms of yield and protein content the CCP's and varieties performed equally (see Table 1). Yields in the season 2013-2014 averaged at 6,5 t/ha for the variety group (4 obj.) and 6,2 t/ha for the CCP group (4 obj.) and in the season 2014-2015 at 7,0 t/ha for the variety group (4 obj.) and 7,2 t/ha for the CCP group (9 obj.). By testing for protein content, sedimentation value (Zeleny) and falling number (Hagberg) it was found that the OY populations do not comply for baking. The OQ populations performed as good as the varieties for these parameters, the OA populations were intermediate.

Respectively yellow rust and drought were the limiting factors for growth in these two seasons. Initially in the season 2013-2014, the CCP's suffered more from yellow rust than the varieties but their infestation rate was stable in the period from April to June. Infestation of the varieties rised quickly in May to June and the highest infestation was observed for varieties Lukullus and Midas. In 2014-2015, yellow rust pressure was only moderate. Late

May, varieties Renan and Skerzzo were significantly less infested than the CCP's. The mild to severe drought in spring persisted through summer but had no apparent impact on the time of ripening and the yield of all objects.

Table 1: Origin and trial results of CCP's and varieties of winter wheat (harvest 2014 and 2015; Tukey HSD).

Name/var.	Origin	2013-2014			2014-2015		
		yield (kg/ha)	protein (%)	yellow rust	yield (kg/ha)	protein (%)	yellow rust
		15% moisture	*15% moisture*	*2014 June 10*	*15% moisture*	*15% moisture*	*2015 May 29*
C CCD13	UK08-DK09-TUM10-HU11-NL12-D13	6056 a	9,3 ab	6,5 a	6557 b	8,6 ab	4,3 d
C CCUK13	HU08-NL09-D10-CH11-F12-UK13	6527 a	9,0 ab	6,5 a			
CCD13 **CA** I	D13, conventional culture	6386 a	9,0 ab	6,5 a	7413 ab	8,3 ab	4,8 cd
CCD13 **OA** I	D13, organic culture	5831 a	9,3 ab	6,3 a	7475 ab	8,2 ab	4,0 d
OA I F13	D14, organic culture				7340 ab	8,2 ab	4,5 cd
OA II F13	D14, organic culture				7027 ab	7,9 ab	4,5 cd
OQ I F13	D14, organic culture				7138 ab	8,7 ab	5,3 bcd
OQ II F13	D14, organic culture				6790 ab	8,5 ab	5,0 cd
OY I F13	D14, organic culture				7568 a	7,8 b	4,0 d
OY II F13	D14, organic culture				7589 a	7,8 b	5,0 cd
Lukullus	Biocer (France)	6363 a	9,5 a	4,8 b	6870 ab	8,5 ab	5,8 bc
Midas	Biocer (France)	6908 a	8,9 ab	5,3 b	7228 ab	8,1 ab	5,8 bc
Renan	Biocer (France)	6338 a	9,4 ab	6,3 a	6992 ab	8,8 a	7,5 a
Skerzzo	Biocer (France)	6655 a	8,7 b	6,5 a	6949 ab	8,3 ab	6,5 ab
Average		6383	9,1	6,1	7149	8,3	5,1
V.C.		5,4	2,9	5,4	5,3	4,6	10,2
p-value		0,19	0,01	0,00	0,01	0,01	0,00
Score 1=				*100% infest.*			*100% infest.*
9=				*no infest.*			*no infest.*

Although, as expected, some differences between CCP's showed up in the results, no in-field characteristics could be proven to be significantly different. The high level of heterogeneity inside CCP plots may be one reason for these low statistical significances.

The results show that these CCP's of winter wheat can keep up with, if not equal the performance of modern reference varieties. The results also suggest that the CCP's have higher resilience, e.g. against yellow rust. Although based on only two years of trial, the results confirm observations by others who experimented with these CCP's.

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