

Comparing organic and conventional vcu testing for spring wheat in the Netherlands

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Protocol for organic VCU

In a pilot research in 2000 we revised the conventional VCU protocol for spring wheat and compared this with a crop ideotype, that we had designed with organic farmers and traders (Table 1). We hypothesised that conventional VCU was not able to select varieties that complied with the ideotype because:

- a number of key traits are not evaluated in conventional VCU (e.g. weed competitiveness)
- bread quality is evaluated in an industrial baking test with white bread and additives, while the organic market requires whole wheat bread and prefers to refrain from additives
- varieties are evaluated in conventional fields with a high level of nitrogen fertilizer

Based on these conclusions we elaborated a VCU protocol for organic spring wheat (Table 2).

The research

From 2001 to 2004 we conducted variety trials at three organic locations. To compare possible differences in ranking between organic and conventional, at one site we conducted a trial in an adjacent conventional field. Dutch seed companies were asked to provide varieties, from their own programme and from foreign companies they represented, that fitted the organic ideotype. Varieties that were tested included existing varieties and new lines that were submitted for regular VCU, in the Netherlands or another country.

The research followed a new organic VCU protocol, that was endorsed by the official Plant Variety Board. Baking test were carried out by a test baker, who also works for the traditional Dutch millers. A large conventional milling factory did additional tests on a voluntary basis. Each year fields were demonstrated to farmers, breeders and processors and results were discussed with interested stakeholders in the winter season.

Table 1. The ideotype of Dutch organic spring wheat

Characteristics	Minimum	Ideal	Priority
Good Baking Quality			
• Hagberg Falling Number	260 s ¹	Optimum profit. This is yield (in kg) times the premium price for baking quality as high as possible	++
• Zeleny Value	35 ml ¹		++
• Protein Content	11.5 % ¹		++
• Specific Weight	76 kg/hl ¹		++
Good Grain Yield	Lavett = 100 (± 6500 kg/ha)		++
Efficient use of (organic) manure	.....²	Desired profit to be gained with as low manuring level as possible	++
Reducing Risk of Diseases			
• Long stem	± 100 cm (Lavett)	± 100 cm (Lavett)	+
• Ear high above flag leaf	± 20 cm	.....	++
• Ear not too compact	.....²	.....²	+
• Last leaves green for the longest time possible (# days before harvest) = stay green index	.....²	.....²	++
Resistance against			
• Yellow Rust (<i>Puccinia striiformis</i>)	6 ³	8	++
• Brown Rust (<i>Puccinia recondita</i>)	7 ³	8	++
• Leaf spot (<i>Septoria</i> spp.)	6 ³	8	+
• <i>Fusarium</i> spp.	.....²	.....²	++
• Mildew (<i>Erysiphe graminis</i>)	8 ³	8	
Supporting Weed Management			
• Good recovery from mechanical harrowing	.....²	.....²	+
• Good tillering	.....²	.....²	++
• Rapid closing of canopy	Like Lavett	Better than Lavett	++
• Dense crop canopy	Like Lavett	Better than Lavett	++
Reducing risks at harvest			
• Stiff stem	7	8	++
• Early ripening	Mid august	First week of August	++
• Resistance against sprouting	7	7	++

¹ Based on the bonus system of Agrifirm (trader of +/- 75% of the Dutch organic wheat production)

² No values were given, because there was no quantitative information available on the item

³ Based on the values for the variety Lavett in the Dutch Recommended List of Varieties of 2000 (Ebskamp & Bonthuis, 1999)

Table 2: Differences between organic and conventional VCU protocol for spring wheat.

	Organic Protocol	Conventional Protocol
Trial site	managed organically, in accordance with EU regulation 2092/91, for at least three years	application of mineral fertilisers and herbicides; no growth regulators are applied and part of the trial is conducted without fungicides
Seed	not chemically treated	chemically treated
Additional plant traits that are not observed in conventional spring wheat VCU	<ul style="list-style-type: none"> recovery from mechanical harrowing speed of closing the crop canopy canopy density distance of ear-flag leaf compactness of the ear resistance against sprouting black molds in the ear 	<ul style="list-style-type: none"> not observed
Evaluation of baking quality	evaluation on whole meal bread without artificial bread improvers	evaluation on white bread with addition of ascorbic acid

Results and discussion

Testing under organic conditions

The comparison of the organic trial with the conventional trial showed high genetic correlations between cropping systems for most traits (Przystalski et al., in print). A few individual varieties deviated from this general trend, though.

From the above one can conclude that for the evaluation of most traits it is not necessary to set up organic trials. However, for detecting varieties with poor baking quality it is essential to have trials under low fertility conditions, because under high fertility conditions the majority of tested varieties showed adequate baking quality. Furthermore, results show that traits like leafiness and ground cover are easier to evaluate in organic fields because differences between varieties are larger and visible for a longer period.

Including additional plant traits in the protocol

Including additional plant traits in the protocol stimulated breeders to submit varieties that on average were taller and more competitive against weeds than the varieties in the regular section of the Dutch variety list. However, none of the new varieties was equal or better in baking quality than the organic standard variety.

Importance of using non-chemically treated seeds

Seed health is important for organic farmers. Using non-chemically treated seeds had an important effect on the results. In some years some varieties showed bad germination in the organic trials, while in the conventional trial with seed treatment there was no problem.

Organic section in the Dutch variety list

Results of the project were included in the Dutch variety list in a separate section on spring wheat varieties for organic farming (Bonthuis et al., 2004).

Conclusions and Future of Organic VCU

To make sure that the VCU system also selects the best varieties for the organic sector we propose:

- a combination of conventional trials with a limited number of additional organic trials
- inclusion of traits of key importance to the organic sector in the research protocol

The future of both conventional and organic VCU depends on the financing. This project was financed by the Dutch Ministry of Agriculture, Nature and Food Quality and Product Board for Arable Farming, but the organic VCU was discontinued after the project stopped. Conventional VCU is financed for 50% by breeding companies and for 50% by farmers. Due to the small organic spring wheat acreage (about 2000 ha) breeders are not willing to invest in organic VCU. The fact that the current research did not result in varieties with a better baking quality did not convince organic farmers to continue financing.

References

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