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EVALUATION OF SPRING MILLING WHEAT CULTIVARS FOR ORGANIC PRODUCTION AT SPEERVILLE (NB), TRURO (NS), AND CHERRY HILL (PEI), 2000

ÉVALUATION DE CULTIVARS DE BLÉ DE PRINTEMPS DE MOUTURE POUR LA PRODUCTION BIOLOGIQUE DE 2000 À SPEERVILLE (N.-B.), À TRURO (N.-É.) ET À CHERRY HILL (Î.-P.-É.)

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Abstract: Yield goals of 1.7 to 2.2 T ha⁻¹ and protein quality targets of 13.5% or more were not universally achieved in 2000 spring milling wheat organic cultivar seed increases carried out in three locations. Wheat yields ranged from 1.1 to 2.0 T ha⁻¹. Milling protein ranged from 11.3 to 14.1%, with most results below 13.5%. Bake tests show all cultivars have potential as commercial bread wheats.

Résumé : Les objectifs de rendement de 1,7 à 2,2 t/ha⁻¹ et de qualité protéique de 13,5 p. 100 ou plus n'ont pas été atteints dans les essais de 2000 de multiplication des semences de cultivars organiques de blé de printemps menés à trois endroits différents. Les rendements variaient de 1,1 à 2 t/ha⁻¹. Le taux de protéine de mouture variait, quant à lui, de 11,3 à 14,1 p. 100, les résultats étant, dans la majorité des cas, inférieurs à 13,5 p. 100. Des tests de cuisson ont montré que tous les cultivars ont un potentiel comme blé boulanger commercial.

Introduction

The demand for locally-grown and organically-grown grains for human consumption has increased dramatically in the 1990s to the point where much of the product has to be imported into the region. A degree of success in growing and processing locally-grown grains has been achieved in New Brunswick, and the industry is ready to grow. One limitation identified by farmers wishing to grow the grains is that available cultivars may not necessarily be the best ones for either New Brunswick conditions or organic farms. This is because, for the most part, they are selected in Western Canada, under conventional management. Farmers were keen to collaborate in selection trials that could identify more appropriate cultivars. In 2000 two certified organic wheat growers and one research facility hosted wheat cultivar seed increases.

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It has been demonstrated that local producers have the potential to fill the demand in the region (Walker and Smith, 1989). Farmers, N.B.D.A.R.D. staff, and other researchers, have identified the need for cultivars of milling grains suited to NB/organic growing conditions (Walker and Smith, 1989-1992; William Brinton, *personal communication*). At the same time, millers have identified the need for adequate quality of product for processing.

Yield and quality of bread wheat. In organic systems, yields of 1.7 to 2.2 T ha⁻¹ would make wheat crops viable, but commonly about 1.1 T ha⁻¹ is achieved with Roblin. Protein levels of 13.5% or more as well as good baking qualities are the goal for millers who buy the wheat from farmers. It is important when seeking higher-yielding cultivars, that they also achieve the quality standards required for commercial mills.

Yields and quality can be improved by cultivar selection, crop management, as well as favourable weather conditions such as dry summer weather (Dormaar *et al.*, 1997; Debaeke *et al.*, 1996). While the weather cannot be controlled, both improved management and selection of appropriate cultivars can help to improve yield and quality.

Cultivars. The cultivars chosen for the seed increase and bake tests include Roblin which is used as our standard, as well as those heritage cultivars that demonstrate promise based on trials in 1999 and 1998: Selkirk, Acadia, Coteau, Park, and Red Fife. Cultivars such as Coteau and Park are presently being used and saved by organic farmers. Heritage cultivars such as Selkirk, and Acadia are of interest because they showed promise during the period when bread wheat was grown extensively in the Maritimes (Nappan Experimental Farm Progress Report, 1953-57; Fredericton Experimental Farm Progress Report, 1953-57; Dr. Hans Nass, *personal communication*).

Management. In cultivar trials conducted by Walker and Smith (1989-1992) on organic farms in New Brunswick, yields of 2 T ha⁻¹ were achieved in an organic system in 1989 with several cultivars (Walker and Smith, 1989). On this particular farm, manure was applied prior to sowing the wheat crop, and weed management was good. The grain was planted by May 18. Therefore, it is reasonable to assume that yield goals of 1.7 to 2.2 T ha⁻¹ are achievable on organic farms in New Brunswick. Unfortunately, protein and other quality indicators were not reported in these organic trials. In 2000, wheat cultivar yields were recorded, but they are not comparable to other years or to each other because they were not planted or analysed based on a randomized or replicated design.

Materials and Methods

Speerville site, Stu Fleischhaker's farm. One milling wheat cultivar (Acadia) was planted on half an acre in May using a grain drill at a rate of approximately

168 kg ha⁻¹. Organic field management practices were used, including application of composted manure. The field was harvested with the help of NBDARD staff and equipment. Mr Fleischhaker observed that the season was unusually cold and damp.

Truro site, Dr. Claude Caldwell's plots, Nova Scotia Agriculture College. Five milling wheat cultivars (Park, Coteau, Roblin, Red Fife and Reward) were established in unreplicated strips at a rate of 425 seeds per m² on May 17. The site is not managed organically, but no synthetic fertilizers, herbicides, or pesticides were used during the growing season of 2000. No composted manure or other fertility amendment was applied. Dr. Caldwell harvested the wheat using a plot combine, allowing for more accurate yield estimates than the other two sites.

Cherry Hill site, John McLaughlan's farm. One milling wheat cultivar (Selkirk) was planted on half an acre in May using a grain drill at a rate of approximately 168 kg ha⁻¹. Organic field management practices were used, including application of composted manure. The field was harvested with the help of AAFC staff and equipment.

For all locations, milling protein analysis and bake quality analysis of 3 kg subsamples were completed at Dover Mills, Halifax Nova Scotia, by Hugh Monteith and staff.

Results and Discussion

Yield, milling protein, and bake quality analysis for six cultivars grown in 2000 are presented in Table 1. Mean yield, milling protein, and bake quality analysis for six cultivars grown in 1998 on Stu Fleischhaker's organic farm in New Brunswick are presented for comparison in Table 2. Results presented in Table 1 are less reliable than those presented in Table 2 because they are from several different locations with no randomized, replicated trial design. Nevertheless, the results provide us with an indication of which cultivars show the most commercial potential.

Yields in 2000 did not achieve yield goals of 1.7 to 2.2 T ha⁻¹, with the exception of Coteau and Roblin (Table 1). This is not a conclusive result as the yields from different locations and management practices, without randomization and replication, should not be compared. The most important quality parameters are milling protein and loaf volume. Selkirk achieved the 13.5% target, and Acadia was close. The rest of the cultivars, grown in Truro, did not achieve the target. This may be partially explained by the fact that in Truro, no fertility amendments were added.

Table 1. Yield and Quality Parameters for Six Milling Wheat Cultivars, 2000

Cultivar	Commercial Standard *	Selkirk	Acadia	Coteau	Park	Roblin	Red Fife
Yield (T/ha)		1.1	1.1	1.8	1.6	2.0	1.4
Quality Parameters:							
Moisture (%)		11.37	11.62	11.59	11.56	12.14	11.35
Protein (%)	> 13.5	14.13	13.1	12.58	11.76	11.82	11.32
Test Weight (Kg/hl)	higher is better	73.0	74.0	79.0	76.4	76.4	76.0
Flour Yield (%)		65.3	67.2	64.5	N/A	71.3	64.4
Flour Protein Content (%)		12.8	11.77	11.24	10.28	10.35	9.89
Wet Gluten Content (%)	< 29	33.8	30.8	27.0	27.7	25.6	25.0
Gluten Index (%)	> 70	96.9	98.2	99.4	98.7	97.9	98.6
Farinograph							
Stability (minutes)	> 8	3.5	7.4	9.0	5.0	4.9	3.0
Absorption (%)	> 62	61.6	59.3	56.6	58.8	60	56.8
Bake Test							
Loaf Volume (539 gms dough)	> 2800 cc	2755	3075	2525	2875	2775	2825
Texture		slightly open	slightly open	fine	fairly fine	fairly fine	slightly open

* General standards sought by commercial bakeries are given here. Roblin is generally considered to be an excellent standard by which to judge other wheats.(Hugh Monteith, Dover Mills, *personal communication*).

Loaf volumes were favourable for all of the cultivars except Coteau. Ironically, Coteau had the best ‘stability’, which means that it should not be rejected from the trial.

Table 2 showing results from 1998, a much drier year than 2000, has more favourable protein percentages. All yields for this location and year were below target. Loaf volumes are in the favourable range for all cultivars except Grandin, which is surprising given its long-standing use as a milling wheat.

Conclusions

Conclusions based on these preliminary results are tentative. None of the cultivars evaluated in 2000 will be dropped from the trial program. Acadia appears to show the most promise for baking quality.

Table 2. Yield and Quality Parameters for Six Milling Wheat Cultivars, 1998

Cultivar	Commercial Standard *	AC Barrie	AC Walton	Teal	Park	Roblin	Grandin
Yield (T/ha)		1.5	1.6	1.1	1.3	1.2	1.1
Quality Parameters:							
Moisture (%)		13.4	13.5	13.5	13.9	13.6	13.6
Protein (%)	> 13.5	14.8	13.2	14.9	14.7	15.2	13.9
Test Weight (Kg/hl)	higher is better	76.9	71.2	75.0	75.6	75.9	77.8
Flour Yield (%)		66.1	61.2	65.6	65.2	69.5	67.2
Flour Protein Content (%)		13.8	11.9	13.3	13.2	14.3	12.4
Wet Gluten Content (%)	< 29	37.5	29.5	35.1	38.3	39.0	30.3
Gluten Index (%)	> 70	74.6	95.9	91.2	71.9	85.7	89.1
Farinograph							
Stability (minutes)	> 8	8.5	6.0	9.0	5.0	9.5	5.75
Absorption (%)	> 62	63.5	61.3	64.3	65.8	65.2	65.5
Bake Test							
Loaf Volume (539 gms dough)	> 2800 cc	2950	2825	2700	2750	2725	2500
Texture		fine	fine	fine	fine	fine	fine

* General standards sought by commercial bakeries are given here. Roblin is generally considered to be an excellent standard by which to judge other wheats.(Hugh Monteith, Dover Mills, *personal communication*).

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