

resistance genes were identified and are being tested in the NUT at 10 diverse sites in Afghanistan in hopes of making high-yielding, stem rust-resistant cultivars available to the farmers in the next 2 years.

## ITEMS FROM ARGENTINA

### CORDOBA NATIONAL UNIVERSITY

College of Agriculture, P.O. Box 509, 5000 Córdoba, Argentina.

#### *The usefulness of crossing methods in recurrent selection schemes.*

R.H. Maich.

During 20 days of September and October 2007, one technician emasculated and approach pollinated 229 wheat and 125 triticale spikes. A total of 17,482 fertile florets were emasculated and 13,767 hybrid seeds were obtained, with a seed set of 78.7%. Approximately 39 hybrid seeds per spike or parent combination enabled a field evaluation of the  $S_0$  progenies that were evaluated under rain-fed and no-till field conditions using one-row plots, 1.3-m long and spaced 0.20 m apart, with a seeding rate of 100 seeds/m<sup>2</sup>. In order to obtain the next cycle of the recurrent selection scheme applied in both species, a selection index consisting of 11 traits was used. At the moment, we are in the sixth (triticale) and ninth (wheat) cycles of recurrent selection.

#### *Morphophysiological changes of wheat seedlings after six cycles of recurrent selection.*

G.B. Melchiorre and R.H. Maich.

The objective of this study was to measure the genetic progress for several seedling morphophysiological wheat traits after six cycles of a recurrent selection scheme conducted under rain-fed conditions. The cycles were characterized through eight variables measured in laboratory: length of the first leaf, number and length of seminal roots, dry weight of the radical system, dry weight of the aerial biomass, and the relation of root to shoot. Except for the seminal radical system dry weight, the remaining traits showed significant differences between the mean values corresponding to the different cycles. Among the recurrent selection cycles evaluated, a negative tendency was verified for both dry weights. In conclusion, the seedling aspects were not neutral with respect to the selection pressure applied to the more conspicuous grain-yield components. A probable progressive adaptation was attained in order to diminish the consumption of water before anthesis, conserving more water for the period in which the number of seed is determined.

#### *An agronomical approach to higher performance in rain-fed bread wheat.*

A.C. Masgrau and R.H. Maich.

The results reported here were obtained from an experience carried out during 2006 at Monte Cristo (Province of Córdoba). No-till bread wheat was cultivated on soybean and corn residue. The stored soil water (0.0–1.6 m) was estimated by means of gravimetric measurements. The soil moisture contents were 133.6 mm (soybean residue) and 147.2 mm (corn residue). The soybean residue soil analysis included organic matter (2.55 %), N-NO<sub>3</sub><sup>-</sup> (9.6 ppm), S-SO<sub>4</sub><sup>-</sup> (1 ppm), and phosphorus (21.9 ppm).

Three bread wheat genotypes were evaluated. On soybean residue, each genotype was cultivated under the following treatments: normal seeding rate (90 kg/ha) with and without phosphorus and at a low-seeding rate (45 kg/ha) with and without phosphorus. On corn residue each genotype was cultivated under a normal and low-seeding rate (without phosphorus). Each treatment was 1 ha. For phosphorus fertilization (15 kg P/ha), triple superphosphate was used. Bread wheat cultivated on soybean residue performed better than that cultivated on corn residue (two q/ha). De-

spite the source of residue, the effect of the seeding rate on grain production was insignificant; 2.014 kg/ha (125 seed/m<sup>2</sup>) for soybean versus 1.948 kg/ha (250 seed/m<sup>2</sup>) for corn residue. Maintaining a constant seed weight, the normal seeding rate sustained production through the spike number/m<sup>2</sup>; on the other hand, the number of seed/spike sustained production in the low seeding rate. With respect to the phosphorus fertilization, genotypes with a higher agronomical performance produced 2 q/ha more than the treatment without phosphorus. The number of spikes/m<sup>2</sup> was the grain yield component that best explained this difference; however, a diminution of the number seed/spike and seed weight was denoted.

### ***Tillage effects on soil properties and wheat rain-fed production.***

A.C. Masgrau, P. Petit, J. Godoy, and R.H. Maich.

Subsoiling a compacted soil should loosen it, improve the physical conditions, and increase nutrient availability and crop yields. The aim of this work was to compare the effects of no tillage and the use of the para-till subsoiler on the physical properties of soil and rain-fed wheat productivity. A split-plot design consisting of five fertilization treatments and two tillage subtreatments was used. Physical properties in the top layers of the soil and wheat grain yield were determined. Vertical tillage reduced the bulk density values (1.29 to 1.19 g/cm<sup>3</sup>), infiltration rate increased to ~40%, and penetration resistance was diminished by 56% in the 10–25 cm layer. Differences in wheat yields were attributed only to differences in the NP fertilization. Production under water-stress conditions was independent of the two tillage systems evaluated.

### ***Genetic progress for forage production in triticale.***

F. Ripoll, G. Vallverdu, and R.H. Maich.

A recurrent-selection program was used to improve forage production in triticale. One cycle/year was obtained since 2000. During 2007, a forage yield trial was performed comparing five cycles of recurrent selection. A completely randomized block design with four replications was used. Each plot was seven rows, 5-m long and 0.20 m apart, with a seeding rate of 250 seed/m<sup>2</sup>. On three occasions, green matter was clipped and dried at 65°C for at least 48 hrs to determine the total dry matter production. A significant linear regression between cycles and forage production was found. An increase of 135.1 kg of dry mater/ha/cycle was estimated. Genetic progress of 4.1 % per year was obtained after five cycles of recurrent selection for forage production in triticale.

### ***The effects of nitrogen and seeding rates on agronomic performance of wheat grown under rain-fed conditions.***

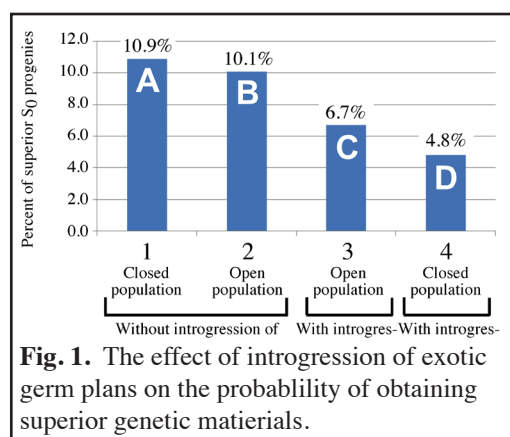
L.R Carraro and R.H. Maich.

During 2007, a seeding and N fertilization trial was performed under no-till conditions. Nitrogen fertilization rates were 0, 20, 40, 60, and 80 N kg/ha; seeding rates were 60 and 120 kg of seed/ha. A commercial cultivar and an experimental line were evaluated. Two treatments of foliar fertilizer were applied. No significant differences between seeding rates were found. The higher number of spikes/m<sup>2</sup> at the higher seeding rate was compensated for by a higher number of seed/spike and a higher number of spikes/plant at the lower seeding rate. The results from N fertilization are not clear. The progressive drought stress typical of the region during the critical period of wheat anthesis must be taken in consideration when seeding and N fertilization rates are examined in detail. These preliminary results suggest that under rain-fed conditions with a regional mean production between 2–3 t/ha, diminishing seeding rates and nearly no N fertilization are two strategies to be considered. However, some evidence about the rational use of both types of fertilization (mineral and foliar) through the partition of N is plausible. Finally, 'genotype x management' interactions are responsible for the difficulty of establishing absolute rules for the dryland production of wheat.

### *The effect of the introgression of exotic germ plasm on the probability of obtaining superior genetic materials.*

G.A. Piacenza and R.H. Maich.

We are working with several types of recurrent selection programs. In some (A and B), only local germ plasm is used; in others (C and D), the introgression of exotic germ plasm is facilitated. In population A, the parents of the next cycle are those pertaining to the same cycle of recurrent selection. In the case of the population B, germ plasm originating from diverse cycles of recurrent selection are crossed. For population C, crosses between local and exotic germ plasm is promoted. Finally, population D is constituted only with exotic germ plasm. Superior  $S_0$  progenies are those with higher yields than the check cultivars. Our results suggest that only those populations with and within local germ plasm yield populations with a higher level of adaptability to the local environmental conditions and give the highest percentage of superior genetic material (Fig. 1).



**Fig. 1.** The effect of introgression of exotic germ plans on the probability of obtaining superior genetic materials.

### *Changes of the realized heritability estimates during a cyclical process of selection and recombination.*

J.A. Isaía and R.H. Maich.

This study estimated the realized heritability for several agronomic traits along three consecutive cycles of recurrent selection in bread wheat (C6, C7, and C8) and hexaploid triticale (C3, C4, and C5). The response to selection from divergent selection schemes is in Table 1.

In the bread wheat breeding program, only harvest index maintained significant differences between the higher and lower selected groups. Moreover, the estimated heritability in the more advanced cycle (C8) was higher than those of the previous cycles (C6 and C7). Considering the hexaploid triticale program, controversial results are generated from harvest index (positive response) and 1,000-kernel weight (negative response). There was general agreement in both the sign and magnitude of response to selection for harvest index in both the bread wheat and hexaploid triticale program. Based on these results, the physiological process of partitioning dry matter to grain production could be improved.

**Table 1.** Heritability for several agronomic traits for bread wheat and triticale during three consecutive cycles of selection. An \* indicates significance and ns indicates nonsignificance.

	Bread wheat			Hexaploid triticale		
	C6	C7	C8	C3	C4	C5
Grain yield	*	*	ns	ns	ns	ns
Biological yield	*	*	ns	ns	ns	ns
Spike number	*	*	ns	*	ns	ns
1,000-kernel weight	ns	*	ns	ns	ns	*
Harvest index	*	*	*	ns	ns	*
Grain number	*	*	ns	ns	ns	ns