PREDICTION OF SEED YIELD OF *FESTUCA* X *LOLIUM* HYBRIDS FROM THE NURSERY MOTHER PLANTS

C. Mousset, L. Hazard and M. Ghesquière
Génétique des Graminées Pérennes, INRA Amélioration des Plantes Fourragères, 86600 Lusignan, France

ABSTRACT
In order to develop commercial *Festuca* x *Lolium* hybrids, their seed production has to be improved. Seed yields of *Festuca* x *Lolium* progenies were assessed in dense plots. Prediction of those seed yields was based on the morphological observations done on spaced plants in the nursery of both mother plants and their progenies. The best prediction of the progeny seed yields is a linear regression on the stem density and the seed weight per inflorescence assessed on the mother plants.

KEYWORDS
Lolium multiflorum, *Festuca arundinaceae*, fertility, interspecific hybridization, morphology

INTRODUCTION
Interspecific hybridization has to face problems with the fertility of the hybrids (Kleijer, 1987; Ghesquière et al., 1993). According to our preliminary experiments, the seed yield of *Festuca* x *Lolium* hybrids was around 50% of that of *Lolium multiflorum* and *Festuca arundinaceae* used as controls. We show that it is possible to predict the seed yield of the progenies from the morphological observations of the stem density and the seed weight per inflorescence of their mother plants.

MATERIAL AND METHODS
In 1988, 50 hybrids (*Lolium multiflorum* 4x x *Festuca arundinacea* var glaucescens 4x) were polycrossed. We studied 37 progenies from the 3rd generation of our breeding program (Jadas–Hécart et al., 1991).

Seed yield was assessed in July 1994 on 2m–long lines spaced by 0.5m. Progenies were sown in April 1993 according to a 3 block design with one line per block for each progeny.

In October 1992, the same progenies were transplanted in the nursery according to a randomized complete block design, with 3 blocks and with 10 plants per block for each progeny. At the same date, mother plants of the progenies were divided into 5 clones and kept in a collection garden. Spacing between plants was 0.7m for both progenies and mother plants. We scored the stem density on a 0–5 scale (0=none; 5=many), the inflorescence type from 1 to 4 (1=spike; 4=panicle). Re–heading was assessed as the number of stems per plant only for the progenies. Seed number per spikelet, seed weight per inflorescence were assessed on 25 inflorescences for each mother plant, as well as the persistency on a 0–5 scale (0=low persistency; 5=high). Seed weight per mother plant was estimated as seed weight per inflorescence x stem density.

RESULTS AND DISCUSSION
The *Festuca* x *Lolium* hybrids yielded 0.78 t.ha^{-1}. This yield was equivalent to that of the parent *Festuca arundinacea* var *glaucescens*. However, it was 60% less than the other parent *Lolium multiflorum*. The best progeny of *Festuca* x *Lolium* hybrid reached 66% of the yield of *Lolium multiflorum*.

Morphological traits of the *Festuca* x *Lolium* hybrids assessed in the nursery were highly variable and ranged the variability between the two parents (Table 1).

Suprisingly, the best prediction of seed yield was done using the morphological traits of the mother plants rather than that of the progenies. The seed yield was predicted as a regression on the stem density (SN) and the seed weight per inflorescence (SWI) (Fig 1):

$$\text{Seed yield (t.ha}^{-1}) = 4.7 + 0.56\ SN + 8\ SWI\ (g) \qquad (R=0.62)$$

There is no need in the first steps of our breeding programme to delay the assessement of fertility in dense plot the year after the observations done in the nursery. It is concluded from that experiment that stem density and seed weight per inflorescence should be used as selection criteria in order to increase the fertility of the hybrids. Until now, our breeding programme for fertility of *Lolium* x *Festuca* hybrids was focused on the inflorescence type. Since the inflorescence type was highly variable among the hybrids and that *Lolium multiflorum* having a spike infloresence exhibited higher seed yields than the fescue, we selected hybrids having a Lolium–like spike. Our selection was successful but did not increased seed yields. As a matter of fact, among the hybrids, seed weight per inflorescence was higher for the panicle type than for the spike type. We think that fertility of *Lolium* x *Festuca* hybrids could be increased by an indirect selection: a selection of mother plants in the nursery is ongoing for a high stem density, a high seed weight per inflorescence and for a panicle inflorescence.

REFERENCES
Ghesquière, M., Z. Zwierzykowski, C. Poisson and J. Jadas–Hécart. 1993. Amphitetraploid festulolium: chromosome stability and female fertility over intercrossing generations. Proc. 17th. Int. Grass. Cong., Hamilton, New–Zealand, pp 451–453.

Kleijer, G. 1987. Cytogenetic studies of crosses between Lolim multiflorum Lam. and Festuca arundinacea Scherb.: III. the generation C1, C2 and C3. Plant Breeding **99:** 144– 150.

Jadas–Hécart, J., C. Poisson, J. Scehovic and Z. Zwierzykowski. 1991. Potential of tetraploid hybrids between *Lolium multiflorum* and *Festuca arundinacea* var *glaucescens*. Proc. An. EUCARPIA Fodder Crop Sect. Meet., Sassari, Italie, pp 145–147.

Table 1
Morphological traits of mother plants and progenies in the nursery

	Mean (Std)	Minimum	Maximum
Mother plants			
Inflorescence type	2.08 (0.16)	1	4
Stem density	2.86 (0.17)	0	4.5
Seed number per inflo.	2.30 (0.18)	0.33	5
Seed weight per inflo. (g)	166 (20)	15	470
Perennity	1.76 (0.15)	0.10	3.5
Seed weight per plant (g)	479 (62)	30	1516
Progenies			
Inflorescence type	1.86 (0.06)	1.28	2.81
Re–heading	9.26 (1.10)	0.23	35
Stem density	2.83 (0.08)	1.59	4.24

Figure 1
Prediction of seed yield of progenies from stem density and seed weight per inflorescence of their mother plants