Many attempts have been made to produce intergeneric Lolium-Festuca hybrids (3). Recent research of this type was stimulated by the desire to combine desirable generic characteristics. A review (3) has listed 17 different successful Lolium-Festuca intergeneric crosses. Earlier work at the U. S. Regional Pasture Research Laboratory resulted in the production of highly sterile triploid ryegrass (L. perenne (2x) × meadow fescue (F. elatior (4x)) hybrids and colchicine-induced autoallohexaploid derivatives (2).

The purpose of the present paper is to report on subsequent derivatives of the triploid and hexaploid intergeneric hybrids and their crosses with tall fescue (Festuca arundinacea Schreb.).

**REVIEW OF LITERATURE**

Reviews of interspecific and intergeneric hybridization in the Gramineae have been published (3, 11). Carnahan and Hill (3) listed 301 such hybrids excluding those involving cereals. Of this number, 17 were Lolium-Festuca hybrids. Festuca elatior has been crossed with Lolium perenne (2, 4, 5, 8, 9, 10, 13, 14). In turn, these hybrids have been crossed with Festuca arundinacea and backcrossed to Lolium perenne (9). Furthermore, hexaploid Festuca arundinacea has been crossed with diploid Lolium species (1, 4, 7, 9). The F1 intergeneric hybrids studied have all been highly sterile. Chromosomes from one genus pair rather well with those from the other genus (1, 2, 4, 5).

Essad (5) produced amphidiploids from two F1 plants of the cross Lolium perenne × Festuca pratensis Huds. Meiotic studies of the amphidiploids revealed slightly fewer quadrivalents and bivalents but more trivalents and univalents than were characteristic of autotetraploid perennial ryegrass. Essad's amphidiploids produced pollen of which about 40% was stainable in contrast to 1.4% for the diploid hybrids and 89% for autotetraploid perennial ryegrass. Buckner et al. (1) obtained the amphiploid (2n = 56) from a 28-chromosome L. multiflorum × F. arundinacea F1 hybrid. This amphiploid produced considerable stainable pollen and gave rise to progenies with 42, 56, or 70 chromosomes.

Lolium-Festuca hybridization has generally been more successful when Lolium was the maternal parent. In addition, (2x) × (4x) was more successful (14) than (2x) × (2x), (2x) × (3x), or (3x) × (4x). Reusch (13) obtained Festuca pratensis × Lolium perenne hybrids only after irradiating the Lolium pollen. Ionizing radiation was presumed to have effected gene changes that reduced genetic imbalance in the hybrid endosperm.

Lewis (10) and later Reusch (13) found that certain genotypes within Lolium multiflorum Lam., L. perenne and Festuca species crossed more readily with the opposite genus than others. Lewis also reported that intergeneric crosses involving L. multiflorum produced more promising breeding materials than those involving L. perenne. Buckner et al. (1) and Lewis (10) further reported higher fertility in L. multiflorum intergeneric hybrids and their derivatives than in comparable hybrids involving L. perenne. Wit (14) and Lewis (10) observed increased male fertility in some open-pollination progenies of triploid F1 Lolium-Festuca hybrids.

**METHODS AND MATERIALS**

Root-tips collected from tillers grown in water or from potted plants were smeared according to the technique of Hanson and Oldeneyer (6) for chromosome-number determination. Inflorescences collected either from the nursery or from plants in the greenhouse were fixed in Newcomer's solution (12) and anthers were stained in aceto-carmine. For most plants approximately 50 cells at metaphase I and anaphase I and not fewer than 100 quartets and 100 pollen grains were analyzed. The same number of cells were not always available for each plant studied.

Autoallohexaploids (2n = 42) derived by colchicine treatment of a triploid (2n = 21) Lolium perenne (2x) × F. elatior (4x) were studied cytologically and interplanted with F. arundinacea (2n = 42) to obtain tri-species hybrid derivatives. Hybrid progenies derived from seed harvested from the autoallohexaploids were identified by the presence of cilia on the aurotes, a character from F. arundinacea.

To obtain first-generation derivatives seed was harvested from tiller-rows of the F1 hybrids. The hybrids had been planted adjacent to a planting of diploid and induced tetraploid F. elatior, diploid L. perenne, and F. arundinacea (2n = 42). Subsequently, a nursery of 600 seedlings was established for sampling for promising backcrosses and tri-specific crosses.

One group of second-generation derivatives from the triploid F1 hybrids was obtained by harvesting seed from 2 first-generation (2n = 28) derivatives from original triploids. Chromosome numbers were determined for a sample of the second-generation derivatives selected for outstanding vigor on each of two dates and for promise as breeding material. Further cytological analyses were restricted to the tetraploid plants in this sample.