HYBRID SEED DEVELOPMENT

INTRODUCTION

- Hybrid seed cultivation is getting popularity in the country because the hybrids are:
  - Higher yielding than open pollinated / synthetic varieties
  - Uniform in size and maturity
  - Suitable for mechanical harvesting
- All hybrids are exotic by one or the other way which are
  - Not bred under local environmental conditions
  - Adaptability to local agro-environmental conditions is low
  - Very costly
  - Danger of mal intensions
- Need to develop local hybrids

Different Methods of Synchronization in Flowering

- Synchronization in flowering is necessary for achieving hybrid seed.
- Flowering besides intrinsic property and phases of plant development, is directly influenced by environmental factors,
  - ✓ Day length
  - ✓ Temperature
  - ✓ Moisture
  - ✓ Soil fertility etc.
- These could be exploited to induce or delay flowering in a plant species.

Different Methods of Synchronization in Flowering

- Multiple planting dates
- Plant density
- Plant pruning
- Grafting a late flowering plant scion to the stock of a plant in bloom
  - ✓ For instance potato is grafted to tomato roots to promote flowering in potato.
- The flowering of plants is ultimately triggered by a hormone or balance of hormones which may also be exploited.

Different Tools of Hybridisation

Besides hand emasculations and controlled pollinations, the following different genetic methods could be useful

- Use of cytoplasmic male sterility
- Use of genetic male sterility
- Use of self incompatibility
- Use of apomictic mode of reproduction
- Use of protogyny (pearl millets)
- Use of harmones to induce male sterility
- Manipulation of temperature for mass emasculations

SINGLE CROSS

- Not a single commercial example is available in legumes.
- Single crosses in grasses are easy and responsive and commercially available
- The development of single cross hybrids necessarily would need to test the combining ability of large number of lines.
- The lines showing best combining ability may be open pollinated in isolation.
- Don't need for fertility restoration in fodder hybrids.
- Low crossability and hybrid infertility occurs in mating between different ploidy levels and different geographic races having the same ploidy level.

SINGLE CROSS

- Different races in a species have different genomes that may not be compatible when brought together.
  - For instance 2n in a population of *Festuca arundinacea* ranges between 28-70 with x=7.
- The variation has been mixed up in populations and only a good cytological work could separate different races having different ploidy levels.
- The genetic systems like self-icompatibility, apomixis, protandry, protogyny, male sterility etc. Could be used in fodder crops to develop single cross hybrids.

DOUBLE CROSS

- The method outlined for single cross could be extended to include more lines to produce double cross hybrids.
- Theoretically double cross hybrids should be lower in yield than corresponding single cross hybrids.
- Self-incompatibility in red and white clover can be manipulated to control single and double cross hybrid seed production.
- It is controlled by multiple S alleles, 64 alleles have been identified in red & white clover, a self fertility factor Sr, is a member of the allelic series and is dominant over the other alleles.

POLYCROSS

- The open pollination offers an opportunity to produce recombinants when usual artificial hybridization is difficult due to small flower size.
- A number of genetic lines are grown together according to a specified scheme.
- Scheme is based on the preference in obtaining the open pollinated crosses.
- Scheme may include the genetic lines expressing self-incompatibility alleles.
- The objective is usually to produce genetic variability and then selection of superior genetic lines, clones or hybrids.

POLYCROSS

- The material thus obtained is evaluated for combining ability and may be used for constructing the synthetics.
- They could be evaluated for the manifestation of mechanical heterosis for mixed forages.

Forage Improvement Through Wide Crosses

Mazenta Seed Production

Sadabahar Seed Production

Inter-specific Hybridization In Grasses

Commercial Name	Female X Male Parents	Common Name
Mezenta	*Zea mays* x *Z. maxicana*	corn x Tespak
Sadabahar	*Sorghum bicolor* x *S. sudanense*	sorghum and sudangrass
Sorghum-Johnson hybrid	*Sorghum bicolor* x *S. helepense*	Sorghum and Johnson grass
Johnson – sudangrass hybrid	*S. helepense* x *S. sudanense*	Johnson and sudangrass
Bajra-Napier hybrid	*Pennisetum americanum* x *P. purpurum*	Pearl millets and Napier grass
Bajra - Buffel grass hybrid	*Pennisetum americanum* x *Cenchrus ciliaris*	Pearl millet male sterile and apomictic Buffel grass
	Andropogon gerardii x *A. hallii*	Big blue stem grass and Sand blue stem grass
	Cenchrus ciliaris x *C. setigerus*	sexual Buffel grass and apomictic bird wood grass

Inter Specific Hybridization In Legumes

- Inter specific hybridisation in legumes is difficult, mostly inter specific hybrids are less vigorous and low in fertility .
- Special techniques like embryo culture, ovule culture, etc are employed to achieve certain inter-specific hybrids.
- No inter specific hybrids of crimson clover, arrow leaf clover, and most of the winter annuals have been reported.