

SHORT COMMUNICATION

**PROSPECTS AND CHALLENGES FOR HYBRID MAIZE SEED
PRODUCTION IN SRI LANKA**

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INTRODUCTION

Maize is a highly cross-pollinated plant. Although a maize plant may be shedding pollen when its stigmas (silks) emerge, normally more than 97% of the seeds produced by any given plant result from pollination with pollen from other plants (Pandey *et al.*, 1998). Shull (1908) was the first to report increased yields from F₁ crosses between inbred lines, which is a result of strength of stalks and of roots, and resistance to specific diseases and insects *etc.* The cumulative interaction of many favourable dominant or partially dominant genes is the cause of hybrid vigour of hybrids.

In the 1990s, about 63% of the world maize area is under hybrids, Asia recording the lowest of 13% (Michael, 1988). A survey reveals that the hybrid varieties contributed 22.4% to the increased world maize production, China recording a yield average of 5 t and USA an average of 7.5 t/ha (FAO, 1995).

Dependence on exotic hybrid seeds has to be restricted for two reasons; the high cost borne by the farmers, which increase the cost of cultivation and the foreign exchange spent on imports. When seed production is well planned and successfully carried out, the price of hybrid seeds could be maintained at a lower level. In Asia it ranges between 4:16 compared to grain price (Michael *et al.*, 1988).

MATERIALS AND METHODS

Seed production of three promising single cross hybrids, KH 84, KH 85 and KH 86, was initiated in an isolated field at Government Farm, Kundasale, during *maha* 2001/02, by open pollination. Two rows were planted to male parent on 0 and 7 days and planting female parent was done, taking flowering date into consideration, to get a nick of silking with pollen shedding of male parent. Four rows were planted to each female parent. Recommended cultural practices were followed. All the female plants were detasseled before

pollen shedding to ensure pollination of all female flowers by pollen produced by the male parent. One pollinator was used to pollinate three females to enable producing seeds of three single cross hybrids in the same field. Area occupied was about 0.03 ha.

During *yala* 2002, the same hybrids were developed in similar manner in a different location in a field of about 0.2 ha. Male: female ratio was 2: 4 as it was in the previous season.

In the following season, only one hybrid was produced at Government Farm, Kundasale. Seed production of three hybrids was carried out at FCRDI, Mahailuppallama, in three different fields. In order to multiply seeds of seed parents, they were planted as pollinator rows and the pollinator of the previous seasons was used as the seed parent. At harvest seeds of the male parents were collected for next planting.

RESULTS AND DISCUSSION

The seed yield recorded during *maha* 2001/02 was about 1680 kg/ha. Though the plot was small a person was employed to chase the birds for 40 days, which escalated the cost of cultivation and therefore the cost of production was not calculated. Even though the seed yield was highly satisfactory, a better seed yield could have been obtained by ensuring proper grain filling of all ears harvested.

In *yala* 2002, seed yield harvested was fairly low, attributed to poor field performance of the crop. Seed yield was about 785 kg/ha, which was almost half of the yield recorded in the previous season. In places with satisfactory drainage, yields were quite high.

A further drop in seed yield was observed in *maha* 2002/03 season, for several reasons. It was a highly wet *maha* season and plant growth and seed germination were highly affected. Phosphorous deficiency was observed in young plants and nitrogen deficiency too could be witnessed due to leaching. Growth of pollinator line was highly affected. The plants remained stunt resulting poor pollen production and unsatisfactory dissemination of pollen grains to pollinate late emerging silks of seed rows. A suitable male should be taller than the female rows and should produce sufficient pollen to pollinate all silks (CIMMYT, 1998). Poor field conditions, delayed the flowering of some seed rows and a dearth of pollen to pollinate late silks was observed. As a consequence, though a fair cob yield was harvested, a poor seed yield of about 435 kg/ha was experienced. Application of liquid fertilizer or providing drainage facilities did not help much in normalizing the situation.

Table 1. Cost of production of maize hybrid seeds during yala 2002 and maha 2002/03, at Government Farm, Kundasale.

Operation	yala 2002			maha 2002/03		
	No labour units/ha	As % of total cost	Labour cost	No labour units/ha	As % of total cost	Labour cost
Land preparation	85	24	19975	85	25	19975
Planting	15	04	3525	15	04	3525
Irrigation	15	04	3525			
Weeding +fertilizer application	60	17	14100	60	17	14100
Detasseling	15	04	3525	15	04	3525
Bird scaring	125	35	29375	125	37	29375
Harvesting	45	13	10575	35	10	8225
Total	360		84600	335		78725
Fuel + fert. & agro chemicals			4831			5786
Total cost			89431			84511
Seed yield/ha		785 kg			435 kg	
Cost of seed Rs/kg		114.00			194.00	

Labor requirement was very high due to small size of the land, which should have managed with 50 labor units under normal situations (or without employing to chase birds in large fields). Application of land preparation machinery was satisfactory, but employment of labor was important for making deep drains for improving drainage. A group of 5-6 skilled workers can de-tassel a hectare of maize hybrid seed field easily, but the number of labour required was high due to lack of skill and small size of the field. For large-scale maize production, the highest labor requirement is record in China, which is about 220 persons (Michael, 1998), and the lowest from USA, which is about 13 man-hours per acre (Jugenheimer, 1981).

Another factor contributing to high cost of cultivation in Sri Lanka is the high labor wages, which is about Rs. 235.00 per head. A comparison of the costs associated with zero tillage and conventional tillage, the former results a 44% reduction of cost over the latter (CIMMYT, 1985), which could also be tried to keep cost of cultivation down.

Breeder's common experience is that under normal situations a seed yield of about 1000 kg can be easily harvested, by maintaining the cost of cultivation below Rs. 40,000/ha, maintaining seed: grain price ratio at a healthy level as in other maize growing countries in the region. Seed prices can be further reduced, by increasing grain yields above given yield level, which is well within the reach under favorable agronomic situations.

The pollen supply is adequate for ensuring a satisfactory seed crop, which should be efficiently harnessed by getting silking of female parent during anthesis. Pollen shed of male rows is seen to complete within 3-5 days

locally, making silking of seed rows overlap with pollen shed critically important for a satisfactory seed yield, locally. Importance of selecting a correct male parent and its proper growth was proved highly important in the third season of seed production, as short height and stunted growth of the male parent resulted poor pollen dissemination and low seed yield finally.

CONCLUSIONS

The study proves that hybrid maize seed production with single crosses would be a prospective venture in Sri Lanka, when essential conditions such as selecting a right location, timely planting of male and female rows and selecting a right parent combination are fulfilled. An emphasis should be given to guarantee the purity of the seed by following stipulated isolation standards and by timely de-tussling of male rows. Seed yield, which is determined by crop agronomy, has a high relevance to synchronization of flowering of two parents. Thorough supervision and timely operations are the key factors of success, which demands the services of skilled persons. Quality assured parent seeds should be regularly supplied by the National Research Programme to enable public/private seed producers to carry out seed production effectively.

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