

HIGH YIELDING DISEASE RESISTANT VARIETIES OF MAIZE FOR THE PLAINS OF WEST BENGAL

BY

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Some composite and hybrid varieties of maize on the basis of their resistant reaction to turcicum leaf blight, maydis leaf blight and charcoal rot, and high yield potential have been recommended for cultivation in the plains of West Bengal. Two varieties, namely Kisan and Dudhia have been found suitable for cultivation during the *kharif* (summer/monsoon) as well as *rabi* (winter) season. Diara and Hunius, on the other hand, have been found suitable for *rabi* season whereas A-de-Cuba and Vijay during the *kharif* season. Like other states of India the farmers of West Bengal also have not been adequately enlightened with regard to the necessity of regular seed replacement in a cross-pollinated crop like maize as opposed to self-pollinated crops like wheat or rice. Therefore, cultivation of composite varieties of maize is to be given first priority to the farmers because this approach takes care of the farmer's reluctance for seed replacement in each crop season, and they can utilise seed of these varieties from their own crop in each season.

INTRODUCTION

Maize Research Programme was undertaken by the All India Coordinated Maize Improvement Project (AICMIP) in the District Seed Farm, Kalyani from 1974 during both *kharif* (summer/monsoon) and *rabi* (winter) seasons with a view to evolve high yielding disease resistant hybrids and composite varieties suitable for the plains of West Bengal. Since then a large number of maize genotypes have been screened against three major diseases, namely turcicum leaf blight (*Exserohilum turcicum*) and charcoal rot (*Macrophomina phaseolina*) during *rabi* season, and against maydis leaf blight (*Drechslera maydis*) during *kharif* season. The yield trials of the individual genotypes have been also separately conducted. The results of these experiments conducted during these years from 1979 to 1985 have been presented here.

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MATERIALS AND METHODS

The seeds of different maize genotypes consisting of hybrids and composites were obtained from the Project Coordinator, AICMIP, IARI, New Delhi-12. The seeds were planted at the University Experimental Farm, Kalyani in a randomised block design in two rows plots. Each row was five meters in length and contained twenty plants with three replications. Normal agronomic practices were followed and no plant protection measure was undertaken during the entire crop season.

Evaluation against the three diseases was done under the artificial epiphytotic condition as described elsewhere in details (Kaiser, 1983). The data on the incidence of the two leaf blights were recorded on the basis of 1 (very slight to slight infection) to 5 (very heavy infection) scale after the flowering and that for the charcoal rot were also recorded after the flowering on the basis of 1 (slight discolouration of the basal internode) to 10 (plant prematurely killed) scale as described by Payak (1975). Finally, on the basis of average disease index, the type of disease reaction in a variety was determined as described elsewhere (Kaiser, 1983). The average yield of grains per hectare was also recorded.

RESULTS AND DISCUSSION

The results of the experiments indicate that the composite varieties of different maturity period are to be recommended for cultivation because the farmers can utilise seeds of their own crops. The reaction of the recommended varieties to the three diseases has been presented in Table 1. The time of maturity and the average yield data per hectare of these recommended types have been presented in Table 2. On the basis of disease reaction and yield potential the recommended types are described here as follows.

(a) *Early maturing composite Diara*

It matures in 80 days in *kharif* and 120 days in *rabi*, and yields 45 quintols per hectare in *kharif* and 55 quintols of grain per hectare in *rabi*; comparatively more drought resistant than other composites. It is moderately resistant to turcicum leaf blight and resistant to charcoal rot but moderately susceptible to maydis leaf blight and hence it is suitable for cultivation in *rabi* particularly in the multiple cropping programme.

(b) *Medium maturing composite Hunius*

It matures in 90 days in *kharif* and 130 days in *rabi*, and yields 45 quintols per hectare in *kharif* and 58 quintols per hectare in *rabi*. It is moderately resistant to turcicum leaf blight and resistant to charcoal rot and hence it is suitable for cultivation preferably in *rabi*.

Table 1. *Reaction of different maize varieties to two leaf blights and charcoal rot**

Maize variety	Turcicum leaf blight		Maydis leaf blight		Charcoal rot	
	Average disease index	Reaction	Average disease index	Reaction	Average disease index	Reaction
A-de-Cuba	3.0	Moderately susceptible	2.4	Moderately resistant	6.3	Susceptible
Diara	2.3	Moderately resistant	3.0	Moderately susceptible	3.5	Resistant
Diara-3**	4.5	Susceptible	3.2	Moderately susceptible	3.6	Resistant
Dudhia**	1.8	Resistant	2.5	Moderately resistant	4.2	Resistant
Hunius	2.5	Moderately resistant	3.2	Moderately susceptible	3.8	Resistant
Kisan	1.9	Resistant	2.1	Moderately resistant	4.0	Resistant
Vijay	2.0	Moderately resistant	2.3	Moderately resistant	6.7	Susceptible

*Results are an average of seven years data.

**Newly introduced variety.

Table 2. *Time of maturity and yield data of five maize varieties during Kharif and rabi season**

Maize variety	Kharif		Rabi	
	Maturity (days)	Yield (q/ha)	Maturity (days)	Yield (q/ha)
A-de-Cuba	100	40	140	50
Diara	80	45	120	55
Hunius	90	48	120	58
Kisan	100	55	140	64
Vijay	110	65	145	70

*Results are an average of seven years data.

(c) *Late maturing composite and hybrid varieties*

Kisan composite—This variety matures in 100 days in *kharif* and 140 days in *rabi*, and yields 55 quintols per hectare in *kharif* and 64 quintols per hectare in *rabi*. It is resistant in reaction to turcicum leaf blight as well as charcoal rot and moderately resistant to maydis leaf blight and hence it is recommended for cultivation in both *kharif* and *rabi* seasons.

Vijoy composite—It takes about 110 days to mature in *kharif* and 145 days in *rabi* with average yield of 6 quintols per hectare in *kharif* and 70 quintols per hectare in *rabi*. It is moderately resistant to both turcicum and maydis leaf blights but susceptible to charcoal rot and therefore, it is suitable for cultivation in *kharif*.

A-de-Cuba hybrid variety—It matures in 100 days in *kharif* and 140 days in *rabi*, and yields about 40 quintols per hectare in *kharif* and 50 quintols per hectare in *rabi*. This variety has very good husk cover which reduces cob damage from diseases and thus it is preferred in hilly regions with very high rainfall. It is moderately resistant to maydis leaf blight but moderately susceptible to turcicum leaf blight and susceptible to charcoal rot and, therefore, it is preferred in the *kharif* season only for cultivation.

Dudhia composite—It has been newly introduced and may be recommended for cultivation in both *kharif* and *rabi* on the basis of resistant to moderately resistant reaction to all the three diseases. However, this variety should be kept under trials for its yield potential.

Diara 3 composite—Although this newly introduced variety was resistant to charcoal rot but it was susceptible to turcicum leaf blight and moderately susceptible to maydis leaf blight and hence it is not suitable for cultivation in the plains of West Bengal.

It may be mentioned here that under the aegis of AICMIP 15 double-cross and three way or double top cross hybrids have been released for cultivation. However, certified seed of only five or six hybrids have been currently produced by the National and State Seed Corporation. In addition, some organization in the private sector has also marketed seed of a few hybrid. But the overall area coverage by the hybrids in different maize growing states has been low (around 20%) and uneven. The Southern States of Carnataka and Tamil Nadu exclusively grow hybrids, mostly Ganga 5, Deccan, Deccan 101 and Deccan 103. In Bihar, hybrid Ganga Safed 2 and Hi-Starch are popular. Lack of enthusiasm among the farmers for planting new certified seed of each crop has been one of the major causes of the low spread of the hybrids. Farmers have not been adequately enlightened with regard to the necessity of regular seed replacement in a cross-pollinated crop like maize as opposed to self-pollinated ones like wheat or rice (Payak and Sharma, 1985).

The AICMIP has also released 11 composites and varieties. Among them Vijay has proved to be the most popular even in Pakistan (Payak and Sharma, 1985). Therefore, cultivation of composite varieties is to be given first priority to the farmers because they can utilise seed of these varieties from their own plots.

But it may be pointed out that among the materials released which are resistant to one disease, or one set of diseases, most turn out to be susceptible to another

set of diseases in different environmental conditions. The same draw-back has been also observed in the present study with the different varieties as presented in Table 1. Therefore, the development of multiple resistance to the major diseases prevalent in the diverse agro-ecosystems of India seems more appropriate. Currently emphasis is placed on the development of varieties through population improvement by the recurrent selection breeding schemes (mostly half - and full - sib family selection methodology but partly also S_1 testing). The strategy lies in increasing the frequency of genes for resistance to major diseases without markedly diluting the original genotypes. The programme is under operation since 1973 and two multiple disease resistant populations (MDRI & MDR II) possess acceptable level of resistance to as many as 12 diseases (Payak and Sharma, 1979, 1981 ; Kaiser and Chowdhuri, 1986). This approach appropriately takes care of the farmer's reluctance for seed replacement in each crop season.

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