to $\underline{cp}_2$. Since Neuffer et al. (The Mutants of Maize, Crop Sci. Soc. Amer., 1968) reported this mutant as $\underline{cp}_1$, this last symbol will be hereafter maintained.

1972 backcross data obtained from 16,715 kernels show a 8.0 ± 0.01% recombination between $\underline{o}_2$ and $\underline{cp}_1$. On the basis of the 1962, 1964 and 1972 data, the recombination values and the order of the chromosome 7 markers $\underline{o}_2$, $\underline{gl}_1$ and $\underline{cp}_1$ should be as follows:

$\underline{o}_2$ (8.8%) $\underline{cp}_1$ (8.7%) $\underline{gl}_1$

$\underline{o}_2$ (14.9%) $\underline{gl}_1$

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1. Evaluations of sources of cytoplasmic male sterility for use in multiplasm hybrid production.

A series of corn inbreds adapted to the Northeastern United States has been crossed onto 39 sources of cytoplasmic male sterility and backcrossed during 3 generations/year for the last three years. The backcross conversions have reached the 8th backcross generation. A list of cytoplasms that were fully male sterile in each inbred background in trials performed in New York in the summer of 1972 and in Florida in the winter of 1972-1973 is presented in Table 1. All of the cytoplasms listed are resistant to Helminthosporium maydis, race T, and Phyllosticta maydis leaf blights. Some of these cytoplasms are currently being incorporated into multiplasm hybrids. A multiplasm version of the single cross hybrid Cornell 101 has been produced using various combinations of male sterile cytoplasms. A limited amount of seed of the cytoplasmic sources is available for distribution.

In addition to the fully male sterile cytoplasms, several cytoplasmic sources form partially male sterile combinations with inbred lines

Table 1

List of Helminthosporium maydis, race T resistant male sterile cytoplasms for 24 inbred lines*

Inbred	Male sterile cytoplasms
A239	C,CA,D,EK,J,K,ME,ML,MY,PS,SD,TA,TC
A619	EP
A632	G,M,RB
A636	RB
AyX138	EK,H,M,SC,SD
AyX145A	CA,H,I,J,L,ME,ML,MY,PS,R,TA,TC,W
AyX157	C,CA,EK,ES,G,H,I,IA,K,ME,RB,SC,SD
AyX187y-1	C,CA,K,RB
Ay49w329	CA,EK,G,H,I,IA,J,K,ME,ML,PS,SD
Ay191-71	B,CA,EK,G,H,I,J,MY,PS, R,TA,W
Ay490-2A	C,CA,EK,G,H,IA,K,M,PS,RB,SD
CO150	B,EK,G,H,I,IA,K,L,ML,MY,PS,TA,VG,W
CrS4HLA	CA,EK,ES,F,G,H,I,IA,J,K,M,ME,PR,PS,R,S,TA,TC,VG
MS89A	CA,EK,G,H,I,J,M,ME,MY,PS,S
MS1334	CA,EK,G,H,I,IA,J,K,ML,PS,TC
MYD410	C,CA,D,G,H,I,IA,K,L,ME,ML,MY,PS,RB,SD,TC
NY63-71-1	D,EK,G,H,I,IA,K,ML,MY,PS,RB,TC
MY821	EK,F,G,I,IA,J,ME,ML,MY,PS,R,S,SD,TC,W
Oh51A	C,RB
Pa884p	CA,G,H,IA,K,M,R
SD10	CA,EK,MY,PS,RB
Va20	C,RB
W64A	J,K,PS,TA
W182BN	B,C,CA,D,EK,ES,F,G,H,I,IA,J,K,L,M,ML,PS,R,RB,S,SC,SD,TA,TC, VG,W

*All cytoplasms gave a rating of 1 or 2 on the 1-5 scale for sterility. (1 = most sterile).

(Table 2). The partially fertile plants shed less pollen and often pollen shedding is delayed after tassel emergence. Although these partially sterile cytoplasms may not be suitable for use as male steriles, they are attractive since they can be detasselled more effectively. The delay in pollen shedding makes it easier to detassel female plants before they shed pollen and the partial male sterility results in less pollen being shed by tassels that are missed.

Table 2

List of *Helminthosporium maydis*, race T resistant cytoplasms that are partially male sterile in inbred combinations*

Inbred	Partially male sterile cytoplasms
A239	S
A495	F,G,H,IA,TC,VG,W
A632	EK,CA,I,IA,J,K,ME,ML,MY,TC
A636	CA,IA,J,K,M,ME,ML,MY,PS,SD,TA,TC
AyX145A	D,EK
AyX187y-2	B,CA,D,M
Ay303E	CA,EK,G,I,K,RB,VG
B8	C,CA,G,H,I,J,M,ML,S,TA,TC,VG,W
C153	EK,F,G,I,K,M,PS,R,S,SD,TA,TC,VG,W
CO113	EK,H,I
CO192	CA,EK,F,G,H,I,IA,J,K,M,R,S,SD,TC
CrS4HLA	D,MY
MS89A	D,L
MS1334	MY
Oh43	CA,G,I,M,ME,PS,RB
Oh51A	EK,G,H,J
Pa33	CA,F,I
Pa884p	EK
Va20	EK

*All cytoplasms gave a rating of 3 on the 1-5 scale for sterility (1 = most sterile).

Our studies of fertility restoration of the male sterile cytoplasms demonstrate the 3 groups (C, S & T) of cytoplasms described by Dr. Jack Beckett at the University of Illinois. In addition, we have identified several cytoplasms that don't fit into any of the groups (Table 3). We have also detected a diversity of fertility reactions within the S group. Certain cytoplasmic sources previously included in this group give the opposite fertility reactions of other members of the group in certain inbred backgrounds (Table 3). Additional groups or subgroups could be developed if partially fertile reactions are considered. Further studies of the genetic and physiological diversity of these cytoplasmic sources of male sterility are in progress.

Table 3

Groups of male sterile cytoplasmic sources with similar fertility restoration reactions

C group:	C,RB
T group:	HA,P,Q,RS,T
S group:	F,H,I,IA,J,MY,R,SD,VG,W
	- cytoplasms similar to S group but which give differential reactions in some inbred backgrounds:
	CA,EK,G,K,L,M,ME,ML,PS,TA
Other male sterile cytoplasms:	B,CH,D,EP,LF
Probably non-male sterile cytoplasms:	NT,OY,SG,181,234

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2. <u>Heat induced autotetraploids of maize.</u>

A series of maize inbreds homozygous for endosperm mutants were exposed to heat and cold shock in an attempt to duplicate their basic chromosome complement. Crosses with known tetraploid stocks indicate the treatment was successful.

Inbreds W64A $\underline{fl_2 fl_2}$ and W153R $\underline{fl_2 fl_2}$ were exposed to 42°C for 30 minutes, 48 hours after pollination. The heat shock was followed by