Additional male-sterile sources

Among plantings of varieties of maize obtained from the North Central Regional Plant Introduction Station, Ames, Iowa, a number of sources were observed to segregate male-sterile plants. These sterile plants were crossed by inbred lines WF9 or Oh51A, which are nonrestoring for the three major cytoplasmic male-sterile groups: cms-C, cms-T and cms-S. Since these inbred lines do not exhibit segregation for male sterility they should carry the normal versions of all nuclear ms alleles.

If the F_1 test cross progeny were fertile, the source of sterility was presumed to be genic, though it could represent a new type of sterile cytoplasm that is restored by WF9 or Oh51A. If the F_1 progeny were sterile, the source of sterility was considered to be cytoplasmic. In this case, the F_1 male-sterile plants were crossed with inbred lines that permit diagnosis of the cms group involved. According to a shorthand notation we have used to indicate restoring capabilities of these inbred lines, + indicates restoration, - indicates non-restoration, and the cms types are considered in the order C, T and S. An inbred line that restores cms-C but not cms-T or cms-S is designated (+ - -); a line restoring cms-C and cms-T but not cms-S is designated (+ + -), and so on. On this basis both WF9 and Oh51A are designated (- - -). Using inbred lines N6 (+ - -) or W23 (+ - -), K55 (+ + -) or M14 (+ + -), and Tr (- - +) or C103 (- - +), it is possible to assign a cms strain to one of the three groups. We find that two or three backcrosses with the recurrent diagnostic inbred line are sufficient for this assignment. Moreover, field analysis of pollen samples of restored plants is a reliable criterion on which to distinguish between cms-C and cms-T on the one hand, and cms-S on the other, since restoration is sporophytic in the former cases, and gametophytic in the latter.

Table 1. Characterization of 17 new male-sterile sources.

P. I. No.	Source	Cultivar	Type sterility
186208	South Africa	Bozeman yellow dent	Genic
213703	Iowa	Yellow dent	cms-S
213717	Iowa	Krug yellow dent	cms-S
213726	Iowa	Miller yellow dent	cms-S
213779	North Dakota	Blue flour	Genic
214199*	Canada	Rainbow flint	cms-S
214287	Iowa	Cassel white	Genic
214296	Iowa	Rainbow flint	cms-S
218131	New Mexico	Cochiti	cms-C
218179	Arizona	San Xavier	cms-C
218187	Arizona	Mojave tribe	cms-C or genic
222313	Nebraska	Mid-season composite	cms-S
279032	Spain	Fino	Genic
279034	Spain	Millo de Regadio	Genic
311236	Virginia	Imprv. Leaming (Ohio)	cms-T
311237	Virginia	Hickory King	cms-S
311244	Virginia	Golden dent	cms-S

*This source has previously been found to carry an S type cytoplasm designated cms-CA (Beckett, Crop Science 11: 724-727, 1971).

The foregoing criteria have allowed placement of 16 new male-sterile sources and tentative placement of a 17th. The uncertainty in the latter case is due to the fact that the only diagnostic line thus far crossed with this source is N6, which produced fertile F_1 progeny. Further testing will allow placement of this source. The results of analyses of the 17 new sterile strains are presented in Table 1.

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Unusual occurrence of phlobaphenes: the non-anthocyanic co-pigments in maize embryo

Investigations on a number of R alleles have shown that the R-nj allele conditions pigmented crown and embryo (plumule). Chemico-genetical studies on the unusual presence of the pigments in the embryo could help in studying gene action. During characterization of these reddish-purple pigments it was found that, apart from anthocyanins, some other water-insoluble co-pigments of non-anthocyanic nature were also present and could be isolated from embryo tissue in ethyl acetate. The solubility of these reddish-purple pigments is ethyl acetate and their degradation during acidic hydrolysis indicate them to be non-anthocyanic. Unlike anthocyanins and anthocyanidins, the absorbance of the pigments does not decrease on standing in the unacidified solvents even after several weeks, and hence they do not undergo pseudo-base transformation. Upon exposure to ammonia vapours, the new pigments darken but do not turn blue; they are insoluble in alkali, and addition of acid results in green colour. Paper chromatographic analysis in Forestal (acetic acid-conc. HCl-water, 30:3:10 V/V) and BAW (butanol-acetic acid-water, 4:1:5 V/V, upper phase) solvent systems gave one spot near the solvent front.

Some colourless hydroxyflavans such as hydroxyflavan-3-ols and hydroxyflavan-3:4-diols are known to occur in nature. On treatment with dilute acids they are easily converted into insoluble phlobaphenes. Dehydrogenative polymerisation of polyhydroxyflavans occurs with formation of brown or red insoluble phlobaphenes, and in nature self-condensation of polyhydroxyflavans proceeds without the assistance of enzymes (non-enzymically). Also, since phlobaphenes of the 3:4-diol series may form considerable amounts of anthocyanidin under acidic conditions, their possible involvement in anthocyanin biosynthesis through 'interconversions' cannot be ruled out unless they play some sole key role in meeting other metabolic demands.

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Biosynthesis of anthocyanins in maize: action spectra and role of phytochromes

Physiological studies on anthocyanin biosynthesis '*in laboratorium*' were carried out to study action spectra and phytochrome reversibility for several alleles of the R locus (R-g:Canada, R-r:Em, R-r:Standard and r-r) using red and far-red filters of predetermined absorption maxima. When exposed for a period of two days with light of restricted wavelengths in the red and far-red regions, maximum anthocyanin synthesis (determined spectrophotometrically) was found at 730 nm. Thus, wavelength dependence for anthocyanin biosynthesis in seedlings given prolonged exposures to light of approximately equal energy shows a main peak at 730 nm and a minor peak at 660 nm. These results indicate complexity of photo-control of anthocyanin synthesis, and that it is controlled by