MALE-Sterility IN NIGERIAN BULRush MILLeTS (PENNISETUM AMERICANUM (L.) K. SCHUM)

M. E. AKEN’OVA
Department of Agronomy, University of Ibadan, Ibadan, Nigeria

Received 28 November 1980

INDEX WORDS


SUMMARY

The occurrence of three male-sterile plants is reported. One in a population of ex-Bormu, an improved recommended variety of day-length neutral ‘gero’ bulrush millet and the two others in the selfed progeny of a population of ‘maiwa’ bulrush millet, a short-day photoperiod-sensitive type. Tests confirmed the cytoplasmic-genic nature of the male-sterility in the ‘gero’ population. No tests could be conducted for ‘maiwa’.

The transfer of male-sterility from the male-sterile Tift 23A bulrush millet, obtained from the United States, into a ‘maiwa’ population is also reported. After six backcrosses the ‘maiwa’ genotype appeared to have been reconstituted against the background of a male-sterility inducing cytoplasm. ‘Maiwa’ male-sterility maintainer plants have also been identified.

INTRODUCTION

The earliest reports of the occurrence of male-sterility in bulrush millet were by KAJJARI & PATIL (1956) and BURTON (1958). Since the release of the cytoplasmic male-sterile Tift 23A (BURTON, 1965), one of the first male-sterile bulrush millet varieties, additional sources of cytoplasmic male-sterility in bulrush millet have been reported (BURTON & ATHWAL, 1967) bringing the number of male-sterile cytoplasm sources to three. Male-sterility in bulrush millet appears to result from an interaction between a recessive gene, ms, in the homozygous state and a male-sterility inducing cytoplasm (BURTON & ATHWAL, 1967).

Tift 23A greatly facilitated the developmental of high grain-yielding hybrids in India (RACHIE, 1966) as well as hybrid varieties of forage bulrush millet in the United States (BURTON & POWELL, 1968). By using male-sterile bulrush millet POWELL & BURTON (1966) demonstrated the feasibility of producing seed of the F₁ hybrid between bulrush millet and elephant grass (P. purpureum Schum.) which, when suitable parents are utilized, has shown high forage potential in parts of the tropics and subtropics (BURTON & POWELL, 1968; CHHEDA et al., 1973, 1974; KRISHNASWAMY, 1962).

Since no male-sterility was known to exist in Nigerian bulrush millets attempts were made in Northern Nigeria to transfer the trait into local materials for use in breeding programmes (BHANDWAI, 1970). Results indicated that the ms allele was absent in a population of ‘gero’ a day-neutral type but present in a population of ‘maiwa’, the
short-day photoperiod-sensitive type. CHHEDA et al. (1974) also reported efforts to transfer male-sterility from Tift 23A into a ‘maiwa’ population in Ibadan, Southwestern Nigeria, for use in the commercial production of ‘maiwa’ bulrush millet × elephant grass F₁ hybrid seed.

This paper reports the natural occurrence of a male-sterile plant in a ‘gero’ population and two others among the segregating progeny of a selfed ‘maiwa’ population. The current status of the Ibadan programme to develop a male-sterile ‘maiwa’ is also reported.

MATERIALS AND METHODS

Natural occurrence of male-sterility

(a) ‘Gero’. In 1977, during a study of photoperiodic responses of some Nigerian bulrush millets at the Teaching and Research Farm, University of Ibadan, Nigeria, one plant in a population of ex-Bormu, a recommended improved local ‘gero’ variety from Northern Nigeria did not shed pollen. Its anthers did not dehisce and they were shrivelled. Two flower heads of the suspected male-sterile plant were bagged together to test self-fertility. Each of two other flower heads on the plant was dusted with pollen from one of the randomly selected male-fertile plants designated gero-1 and gero-2, which were also selfed.

A portion of seeds resulting from the crosses was sown in the same year and the progeny examined and tested by selfing, for evidence of male-sterility.

(b) ‘Maiwa’. In the course of a selfing programme in a ‘maiwa’ population, two plants in one of the progeny lines had partially extruded shrivelled anthers and did not shed pollen. Some flower heads were bagged for selfing. Crosses to male fertile plants could not be made owing to severe ergot (Claviceps sp.) infestation of flower heads which rendered meaningful pollen gathering impossible.

Transfer of male-sterility into ‘Maiwa’

Attempts to develop male-sterile ‘maiwa’ genotypes for use in the commercial production of seed of the bulrush millet × elephants grass F₁ hybrid were initiated in 1970. ‘Maiwa’ was crossed with the cytoplasmic male-sterile Tift 23A and male-sterile plants in the resulting progeny, which were identified by either shrivelled anthers or non-extrusion of anthers, with absence of pollen shedding, were backcrossed repeatedly to ‘maiwa’. Two back-crosses were made in a year whenever irrigation was available in the dry season. Random samples of plants in the ‘maiwa’ population were used as recurrent parents in the backcrossing programme with the view of retaining its essential features particularly as regards the short-day photoperiod-sensitivity of ‘maiwa’, a trait which distinguishes the type and makes it a suitable bulrush millet parent in crosses with elephant grass (CHHEDA et al., 1973).

From the third backcross, selection within both the backcross progenies and ‘maiwa’ was modified to include (i) traits that would facilitate seed production especially with respect to shorter range of variation for days to flowering, (ii) forage characteristics