Key access and utilization descriptors for maize genetic resources

This list consists of an initial set of characterization and evaluation descriptors for maize utilization. This strategic set of descriptors, together with passport data, will become the basis for the global accession level information portal being developed by Bioversity International with the financial support of the Global Crop Diversity Trust (GCDT). It will facilitate access to and utilization of maize accessions held in genebanks and does not preclude the addition of further descriptors, should data subsequently become available.

Based on the comprehensive list 'Descriptors for Maize' published by CIMMYT and IBPGR (now Bioversity International) in 1991, the list was subsequently compared with a number of sources such as UPOV technical guidelines for Maize (1994), 'Descriptors for MAIZE' (USDA, ARS, GRIN), 'Global Strategy for the *Ex situ* Conservation and Utilization of Maize Germplasm' (GCDT, 2007), Dr Taba's poster presented at the meeting held at the Sociedad Mexicana de Fitogenética (SOMEFI) in September 2008, 'Descriptors for Characterization and Evaluation of Maize' (National Institute of Agrobiological Sciences, Genebank of Japan), as well as with those descriptors that were awarded funds for further research by the GCDT in 2008 Evaluation Awards Scheme (EAS). The initial list also builds on the results of the Global Public Goods Activity 4.2.1.1, with special attention to breeding traits. It was further refined during a meeting held at the National Bureau of Plant Genetic Resources (NBPGR, India) in June 2009. It involved several scientists from NBPGR and the valuable contribution of Dr Sain Dass of the Directorate of Maize Research, Indian Council of Agricultural Research (ICAR).

A worldwide distribution of experts was involved in an online survey to define a first priority set of descriptors to describe, to access and to utilize maize genetic resources. This key set was afterwards validated by a Core Advisory Group (see 'Contributors') led by Dr Suketoshi Taba of International Maize and Wheat Improvement Center (CIMMYT).

Biotic and abiotic stresses included in the list were chosen because of their wide geographic occurrence and significant economic impact at a global level.

Numbers in parentheses on the right-hand side are the corresponding descriptor numbers listed in the 1991 publication. Descriptors with numbers ending in 'letters' are either modified or new descriptors that were added during the development of the list below.

PLANT DATA

Days to tasseling (male flowering) (4.1.1)
Number of days from sowing to when 50% of the plants have shed pollen

Days to silking (female flowering) (4.1.2)
Number of days from sowing to when silks have emerged on 50% of the plants

Days to ear leaf senescence (4.1.3)
Number of days from sowing to when 50% of the plants have a dry ear leaf

Plant height [cm] (4.1.4)
From ground level to the base of the tassel. After milk stage

Ear height [cm] (4.1.5)
From ground level to the node bearing the uppermost ear. After milk stage

Foliage rating (4.1.6)
Rating of total leaf surface

Number of leaves above the uppermost ear including ear leaf (4.1.7)
Counted on at least 20 representative plants. After milk stage

Root lodging [%] (4.1.10)
Percentage of plants root-lodged. This trait indicates root strength and standability. Two weeks before harvest

Stalk lodging [%] (4.1.11)
Percentage of plants stalk-lodged. Two weeks before harvest

Tassel type (4.1.13)
At milk stage

1 Primary
2 Primary-secondary
3 Primary-secondary-tertiary

Ear husk cover (4.2.1)

3 Poor
5 Intermediate
7 Good

Ear damage (4.2.2)
Rating of kernel health. Amount of ear damage caused by ear rot and/or insects, etc.

0 None
3 Little
7 Severe

Number of kernel rows (4.2.4)
Count number of kernel rows in the central part of the uppermost ear

Kernel type (4.3.1)
Indicate up to three kernel types in order of frequency

1 Floury
2 Semi-floury (morocho), with an external layer of hard endosperm
3 Dent
4 Semi-dent, intermediate between dent and flint but closer to dent
5 Semi-flint, flint with a soft cap
6 Flint
7 Pop
8 Sweet
9 Opaque 2/QPM
10 Tunicate
11 Waxy

Kernel colour (top of grain) (4.3.2)
Indicate up to three colours in order of frequency

1 White
2 Yellow
3 Purple
4 Variegated
5 Brown
6 Orange
7 Mottled
8 White cap
9 Red

1000-kernel weight [g] (4.3.3)
Adjusted to 10% moisture content

Ear length [cm] (6.2.2)

Ear diameter [cm] (6.2.4)
Measured at the central part of the uppermost ear

Shape of uppermost ear (6.2.10)

1 Cylindrical
2 Cylindrical-conical
3 Conical
4 Round

Kernel length [mm] (6.3.1)
Average of 10 consecutive kernels from one row in the middle of the uppermost ear, measured with a calliper

Kernel width [mm] (6.3.2)
Measured on the same 10 kernels as 6.3.1

Grain yield (6.3.X)

ABIOTIC STRESSES

Drought (7.5)
Reflected in seed yield relative to control

BIOTIC STRESSES

Ear rot, stalk rot (*Diplodia maydis*, *Gibberella zeae*, *Fusarium moniliforme*) (8.1.1)

Common rust in temperate and highland environments (*Puccinia sorghi*) (8.1.2a)

Southern rust in tropics (*Puccinia polysora*) (8.1.2b)

Downy mildew (*Peronosclerospora* spp., *Sclerophthora* spp.) (8.1.3)

***Maydis* leaf blight** (*Bipolaris maydis* syn. *Helminthosporium maydis*) (8.1.4a)

***Turcicum* leaf blight** (*Exserohilum turcicum* syn. *Helminthosporium turcicum*) (8.1.4b)

Corn stunt (Corn stunt spiroplasma) (CSS) (8.2.1)

Borer (*Chilo* spp.) (8.3.2)

Borer (*Sesamia* spp.) (8.3.6)

CONTRIBUTORS

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