Chapter 3 Forage Crops

Sorghum [*Sorghum bicolour* (L.) Moench]

Prepared

BY

Prof. Dr. Ali E. M. Sharief

Faculty of Agriculture, Agronomy Dept., Mansoura University, Egypt

Introduction

Sorghum [*Sorghum bicolour* (L.) Moench] is an indigenous crop to Africa, and though commercial needs and uses may change over time, sorghum will remain a basic staple food for many rural communities. The latter is especially true in the more drought prone areas of South Africa where this hardy crop provides better household food security than maize. Sorghum is mainly cultivated in drier are as, especially on shallow and heavy clay soils. Sorghum belongs to the grass family, *Graminea*. It is essential that producers know the crop they are cultivating in order to develop the most effective production practices.

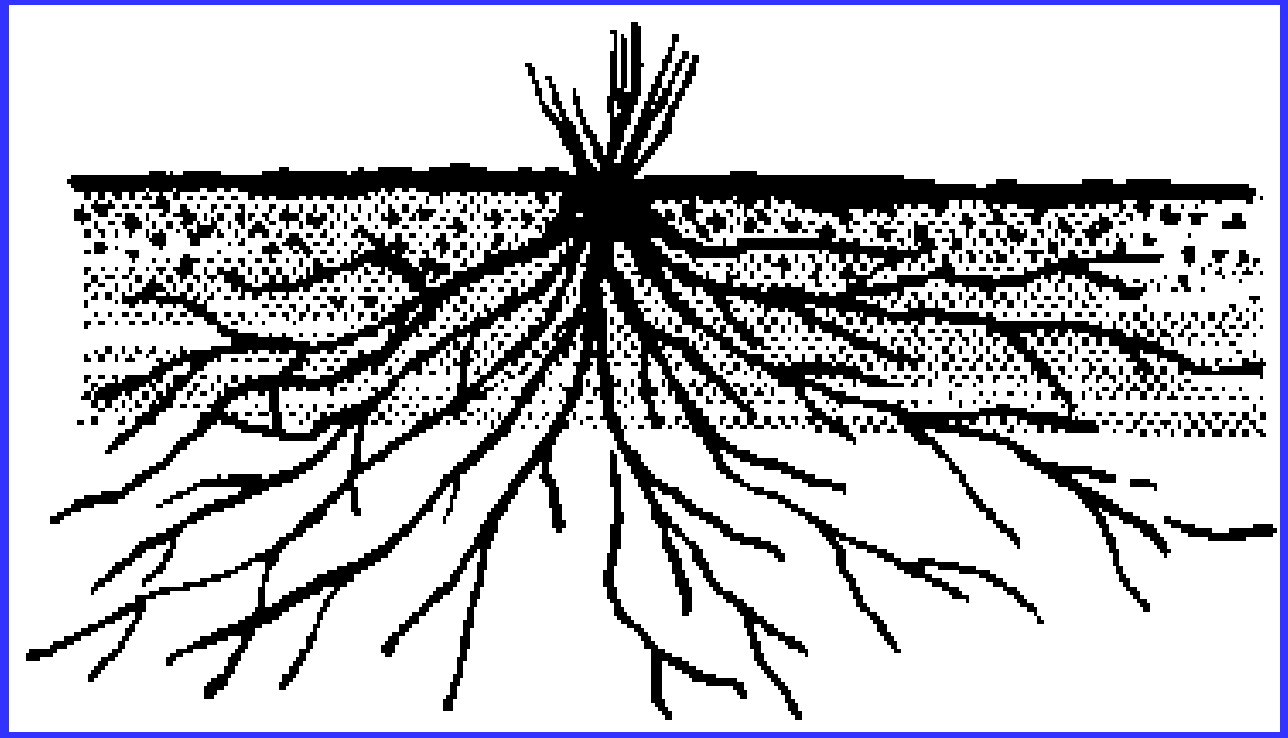
Grain and Forage Sorghum

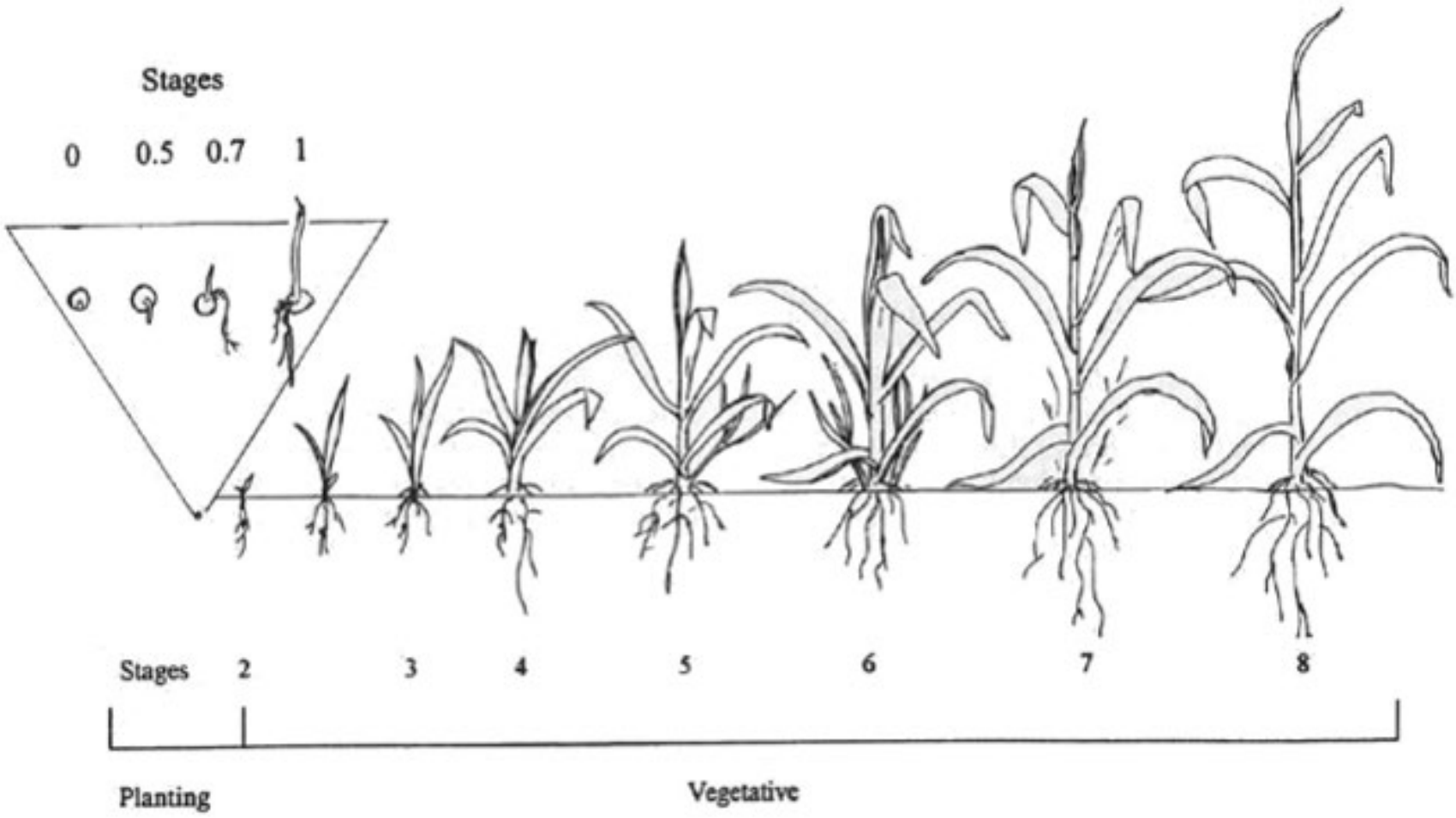
Root system:

The roots of the sorghum plant can be divided into a primary and secondary system. The primary roots are those which appear first from the germinating seed. The primary roots provide the seedling with water and nutrients from the soil. Primary roots have a limited growth and their functions are soon taken over by the secondary roots. Secondary roots develop from nodes below the soil surface. The permanent root system branches freely, both laterally and downwards into the soil.

If no soil impediments occur, roots can reach a lateral distribution of 1 m and a depth of up to 2 m early in the life of the plant. The roots are finer and branch approximately twice as much as roots from maize plants.

Root distribution





Growth stages

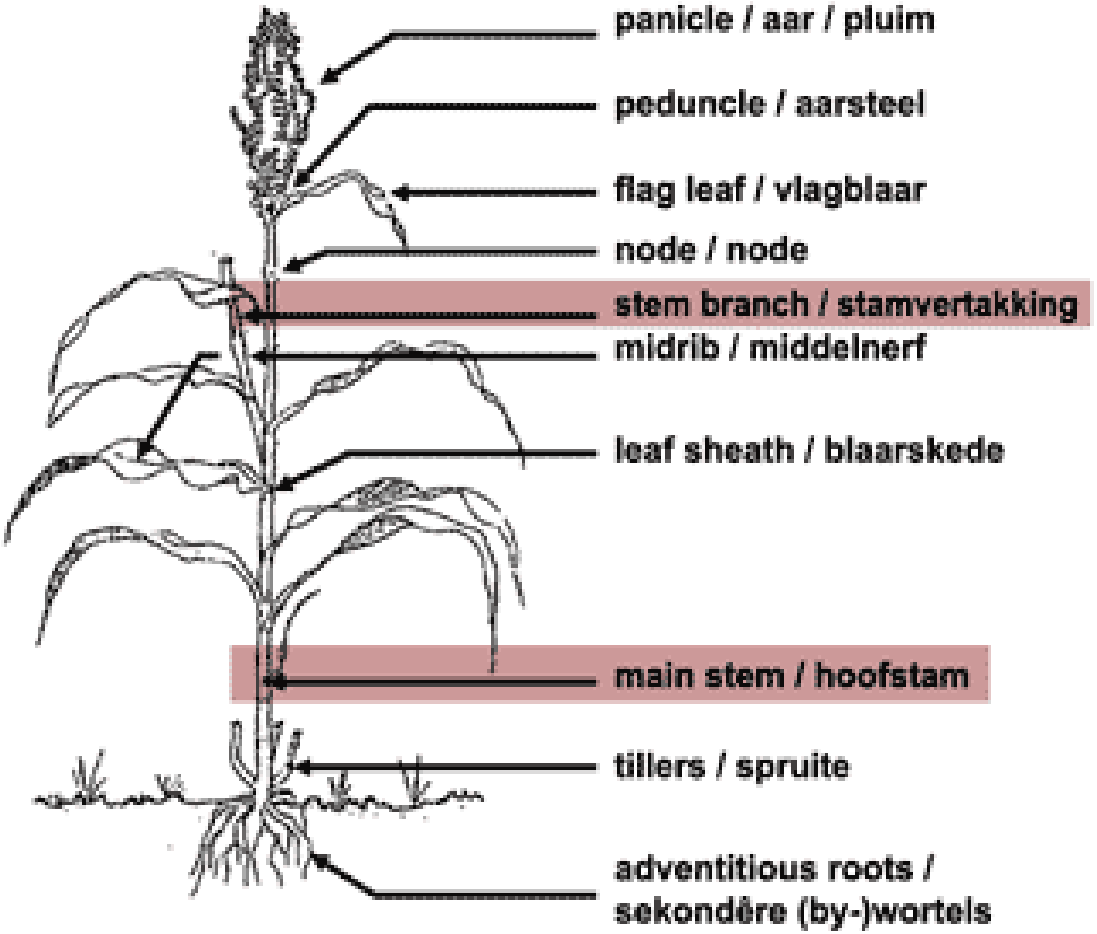


Diagram of the sorghum plant and its components. Illustration by Anthony B. Pearson

Sorghum plant

Leaves

Sorghum leaves are typically green, lass like and flat, and not as broad as maize leaves. Sorghum plants have a leaf area smaller than that of maize. The leaf blade is long, narrow and pointed. The leaf blades of young leaves are upright but the blades tend to bend downwards as leaves mature. Stomata occur on both surfaces of the leaf. A unique characteristic of sorghum leaves is the rows of motor cells along the midrib on the upper surface of the leaf. These cells can roll up leaves rapidly during moisture stress. Leaves are covered by a thin wax layer and develop opposite one

another on either side of the stem. Environmental conditions determine the number of leaves, which may vary from 8 to 22 leaves per plant.

Stem

The stem of the plant is solid and dry, to succulent and sweet. Under favorable conditions more internodes develop, together with leaves, producing a longer stem. The stem consists of internodes and nodes. A cross section of the stem appears oval or round. The diameter of the stem varies between 5 and 30 mm. The internodes are covered by a thick waxy layer giving it a blue-white colour.

The waxy layer reduces transpiration and increases the drought tolerance of the plants. The root band of nodes below or just above the soil surface develops prop roots. The growth bud develops lateral shoots. Sometimes the growth buds higher up the stem may also develop lateral shoots.

Sorghum tellering

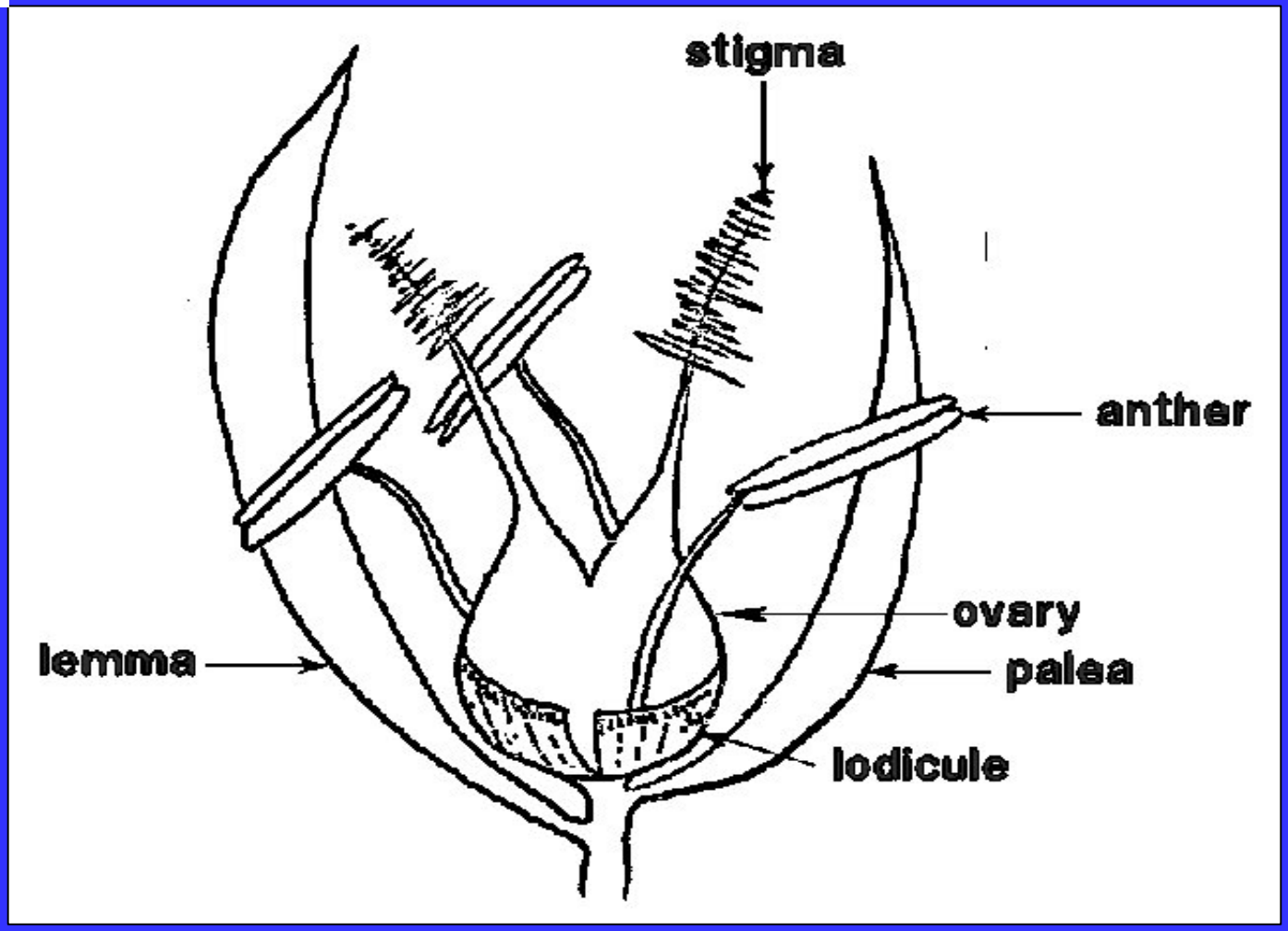
Leaves and stems

Inflorescence (panicle)

The inflorescence of sorghum, the panicle, may be compact or open. The shape and colour of the panicle varies between cultivars. Panicles are carried on a main stem or peduncle with primary and secondary branches on which the florets are borne. The peduncle is usually straight and its length varies from 75 to 500 mm. Each panicle contains from 800 to 3 000 kernels which are usually partly enclosed by glumes. The colour of the glumes may be black, red, brown or tan.

Flowers:

The flowers of sorghum open during the night or early morning. Those at the top of the panicle open first and it takes approximately 6 to 9 days for the entire panicle to flower. Because of the structure of the flower, mainly self-pollination takes place. A small percentage of cross-pollination (approximately 6 %) occurs naturally.



Sorghum flower

Grain

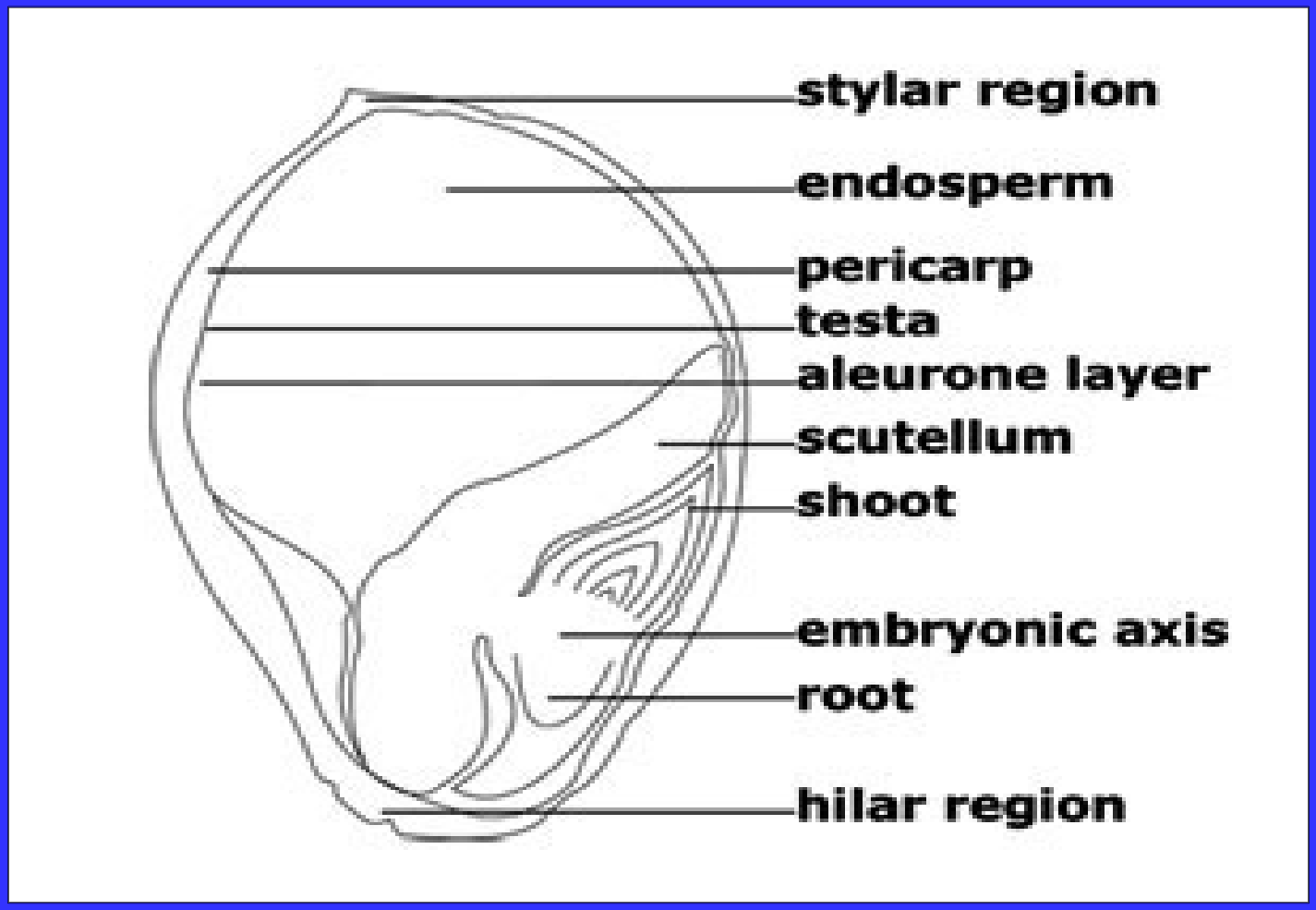
The ripe grain of sorghum is usually partially enclosed by glumes, which are removed during threshing and/or harvesting. The shape of the seed is oval to round and the colour may be red, white, yellow, brown or shades thereof. If only the pericarp is coloured, the seed is usually yellow or red. Pigment in both the pericarp and testa results in a dark-brown or red-brown colour. The sorghum grain consists of the testa, embryo and endosperm. Endosperm about 81-85% from seed size as shown in Table 2

Seed coat: The seed coat consists of the pericarp and testa.

Pericarp: This is the outermost layer of the seed and consists of the pericarp, hypodermis, mesocarp and endocarp.

Description	Percentage (%)
Seed coat	7,3 – 9,3
Embryo	7,8 – 12,1
Endosperm	81,1 – 84,6

Composition of the sorghum grain as a fraction of total mass



Grain structure

Sorghum grain

1- Sorghum belongs to the genus

a) Arachide. b) Sorghum.

c) Cicer. d) Leguminosae.

2. The scientific name of cultivated Sorghum is

a) Sorghum bicolour b) *Cicer pinnatifium.*

c) *medicago sativa.* d) *Cicer cuneatum.*

3- Sorghum belongs to the ……family.

a- grass b- legume

c- chenopodiaceae d-convolvulaceae

4-in sorghum plant the root system consist of ……

a- tap root b-Seminal roots

c- adventitious roots d-both b and c

5- Secondary roots develop from nodes below the soil surface.

a-above

b- below

c-along the main stem

d- both a and c

6- (true)Sorghum leaves are not as broad as maize leaves and leaf area smaller than that of maize.

7- (true)sorghum leaves have motor cells along the midrib on the upper surface of the leaf. These cells can roll up leaves rapidly during moisture stress.

8- (false)The waxy layer along the stem of sorghum increase transpiration and reduce the drought tolerance of the plants.

9- (true)The root band of nodes below or just above the soil surface develops prop roots in sorghum.

10- Each panicle contains from ……..kernels which are usually partly enclosed by glumes.

a-300-400 b-500-600

c-200-300 d-800 to 3000

11-(true)mainly self-pollination takes place in sorghum. And small percentage of cross-pollination (approximately 6 %) occurs naturally.

12-(false) The ripe seed (grain) of sorghum is usually partially enclosed by glumes, which are not removed during threshing or harvesting.

13- The sorghum grain consists of ……

a-the testa, embryo and endosperm

b- the testa, tassel and endosperm

c- the testa, embryo and ear

D-the radical, embryo and endosperm


Thank
You!