CORRELATION BETWEEN YIELD AND SOME AGRONOMIC CHARACTERS IN *SESAMUM INDICUM*

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1- INTRODUCTION

Sesame (*Sesamum indicum*) is an annual crop belonging to the family *Pedaliaceae*. It is one of the most important oil seed crops grown in tropical and sub-tropical regions. Its origin is mostly in Africa and from there it spread both east and west across Asia to many countries, where it became established as an important oil seed crop of considreble antiquity, De Candolle(1865).

At present time, the largest acreage of sesame is grown in India, China, Burma and many parts of of Asia, Africa and Latin America. The major exporting countries in the season 1970 were Sudan(81890 metric tons) and Nigeria (12100 metric tons) while the principal importers were Japan (52705 metric tons) and Italy (40289 metric tons) as reported by Trade Yearbook (1971).

In India, China and Burma, about 4.1 million hektars are grown, and this area occupied about 74% of the total area in the world.

World production of sesame as reported in the Production Yearbook(1971) amounted to 2,098,100 metric tons in 1971 destributed as follows: 461,700 metric tons

[illegible] 4[illegible] metric tons in India, 38[illegible],400 metric tons in South and Central America, 183,600 metric tons in Africa and 7,600 metric tons in Europe.

In A.R. Egypt the sesame acerage was about 25,000 Hectar(56,000 Feddans) mainly grown at provinces of Upper Egypt at (Gizs, Assyout, Souhag, Qina, Aswan) and the provinces of lower Egypt at (Ismaeilia and Sharkia).

The total yield was (962800 ardabs) 11,600 metric tons, and this amount is less than the local consumption. About (184.000 to 185,000) ardabs, i.e., (22,000 to 23,000) metric tons are imported annualy from Sudan. This quantity is used in different purposes in manufacture and human diet, as it contsins protein of high quality, calcium, phosphorus and the vitamin niacin, but it is low in the amino-acid lysin. Attention has been directed at present time in this country to raise the productivity level of the local cultivars by new introductions from other parts of the world and by hybridization and selection, to increase the total yield per unit area. It is important for plant breeders to

have a knowledge of genetic behaviour of different agronomic characters, in order to improve yield production. It is also important to study the relationships between agronomic characters and the yield per plant to help in selection programs.

This work was carried out to investigate the genetic behaviour of some economic characters, namely stem length, productive stem length, number of capsules per leaf axil, number of carpels per capsule and seed colour.

The work aimed also to study the relation between yield and some agronomic characters as plant height, length of productive stem, number of branches, number of capsules per plant and weight of 1000 seeds.

I- REVIEW OF LITERATURE

A- Inheritance of some morphologic characters.

1- Number of capsules per leaf axil

The genetic behaviour of this character was studied by the following authors:

Nohara (1933), reported that presence of nectar glands replacing the two lateral flowers was dominant over accessory flowers and was controlled by a single gene.

John (1934), pointed out that a single flower per leaf axil was dominant to many flowers in some crosses involving this character.

Langham (1945-a), crossed Selection No. 5 (three pods per leaf axil) with Criollo (one pod per leaf axil), and found that F_1 had a single pod. In the F_2, it segregated into single and three pods per leaf axil. This character seemed to be determined by a single pair of genes designated as (T,t). He suggested that the three pods per leaf axil was determined by the single recessive gene (t). However, this character is variously expressed in different crosses, where the number of capsules varies along the fruiting axis and ranges from one to three.

[illegible] (1945-b), [illegible] the extra [illegible] in the leaf axil was determined by a single recessive gene designated (t). The results of crossing the three-podded cultivars from China and India with Venezuela three-podded Selection No. 5, indicated that the gene for the three-podded character was the same in the three cultivars.

Sikka and Gubta (1947), reported that the solitary flowered condition was found to be dominant over the three flowered, and was dependent upon a single gene difference. The gene pair conditioning number of flowers per axil was designated as (M,m).

Rao and Subbiah (1955), noted that the one to three flowers in leaf axil (in contrast to the normal one flower in each leaf axil), although this character was an inherited one, yet its expression was largely controlled by seasonal conditions.

Culp (1960-b), suggested from studying three crosses that one capsule per leaf axil was dominant over three capsules per leaf axil, and was controlled by one pair of Mendelian genes (T,t). He reported also that there was no indication of linkage between peper-shell capsules, capsule number per leaf axil and plant colour.

Kranti et al.(1967, showed that capsule number was the most variable character on the main stem.

Sehgal and El-Ahmar (1970-a) showed that number of pods per leaf axil was simply inherited in three sesame cultivars, with the dominance of single pods over three pods, and a monohybrid ratio was obtained in both F_2 and F_3 generations.

2- Number of carpels per capsule

It is commonly known that sesame fruit is usually bicarpellary, however some cultivars produce tetracarpellary fruits. The inheritance of this trait was studied by the following authors:

Langham(1945-b),found in crossing Venezuela cultivars and the reciprocals that bicarpellary fruits were dominant over tetracarpellary, also complete correlation was found between presence of glands and bicarpellary fruits. Nevertheless, within the cultivar Jaffa dominance of tetracarpellary fruits and dorsally glabrous leaves was shown.

Yadev (1968), found a spontaneous mutant of the cultivar St.23B having larger capsules than the parent and a quadrified stigma. Crosses using the mutant as a male parent indicated that the bicarpellary condition was controlled by a single dominant gene, and it was suggested that the quadrified stigma was pleiotropically controlled by the gene for tricarpellary ovary.

Demir (1970, reported after analysis of the F_1 and F_2 from crosses between the quadricarpellatum and bicarpellatum types, that the later character was dominant and was controlled by two genes. The quadricarpellatum character was associated with fasciation.

3- Seed coat colour:

Seed colour is highly important in sesame consumption and trade. White seeds are more preferable than dark coloured seeds. Different results were obtained by various workers for the genetic behaviour of this character as reviewed below:

Abe (1919), was the first to investigate the genetic behaviour of seed colour in sesame showing the dominance of black seed coat colour to both white and brown colours, and claimed that factors controlling this character were two pairs.

Ieshima (1931), noticed that the black colour was completely dominant over the white in the F_1, but in the F_2 he obtained 20 intermediate colours besides black and white. He concluded that black and white colours were controlled by three different pairs of genes.

Ohara (1933), pointed out that black colour of seed coat was dominant over cinnamon buff, and the later was dominant over white, from crosses between black X white, black X cinnamon buff (light yellowish brown) and cinnamon buff X white. In black X white crosses, he obtained a wide segregation in F_2 as: black, cinnamon (yellowish brown), cinnamon buff, avellaneous, penkish, light buff and white. He indicated that this diversity of seed colour was probably due to degrees of maturity and dryness of seeds. However, this range of colour was classified genetically into four groups only: black, dark brown, pale brown and white, fitting the ratio of 9:3:3:1, respectively. In cinnamon buff X white crosses, the F_2 seed colours were classified into four groups; cinnamon buff, pinkish buff, pale buff and white fitting the ratio 9:3:3:1. Finally, he concluded that each of these contrasted colours differed in two pairs of genes.

Pale (1934), reported that white colour was recessive to the darker colour of the seeds, and that this character was controlled by a single pair of genes.

Patel(1936), confirmed the two factor pair difference between white and black seed coat colour in sesame crosses.

Paul and Gayvala (1941), showed that black colour was dominant to brown and both colours were dominant to white.

Sikka and Gupta (1947), reported that dirty white colour of seeds behaved as a simple recessive to dark brown. Black colour of the seeds was dominant to dirty white, the expression of these two colours was depending upon two factor pairs. The factor combination for dirty white, dark brown and black seed colour have been designated as (cbd, cbD, CBD), respectively.

El-Ahmar (1970), symbolised three pairs of genes for seed colour in sesame cultivars, (W) for white seed colour, (B) for brown seed colour and (K) giving black seed colour when present with (B) in their homozygous condition only. He suggested the genotypes, (KKBB ww) for black seed colour in Type 22, (kkBBww) for brown seed colour in the cultivar Margo and (kkbbWW) for white seed colour in the local cultivar Giza 23.

Khidir and Ali (1971), reported in their studies on seed colour that black colour was dominant over both brown and white colours, and the brown colour was

[illegible] over [illegible] colour. The black and the white colours were controlled by a two factor pairs difference giving a 9:3:3:1 ratio of (black, dark grey, grey and white seed colours) in the F_2. Likewise, the brown and the white colours gave a dihybrid ratio of; 9 brown: 3 light brown: 3 grey :1 white seeds. The crosses between brown and black-seeded parents showed a monohybrid segregation. The factorial constitution of the parents was assumed to be as follows: black (AABB), brown (AAb^Rb^R), white (aabb).

4- Plant height:

Sesame cultivars differed greatly in their plant height, ranging from 65 cms. to 300 cms. Plant height is considered as one of the main objectives in sesame breeding in different locations. The genetic behaviour of this character was studied by several authors as reviewed below:

Mazzani (1959), studied plant height and seed oil content in a group of ten Venezuela cultivars, and found no correlation between the two characters.

Culp (1960-a), concluded that the inheritance of plant height in sesame was controlled by 3-10 pairs of genes, with heritability values of 40-50%. In three

crosses tall plants were completely dominant while in the fourth no dominance of genes was observed. He found a small but significant positive correlation between plant height and capsule length in three crosses, so he expected that this would lead to no difficulties in selecting for desirable combinations of the two characters.

Dabral (1967), found that plant height exhibited high heritability values in sesame.

5- Length of productive stem (fruitful part of the stem).

It is greatly desirable to produce new cultivars having a lower fruiting internode, aiming to increase the number of pods per plant. Few studies were reviewed on this character that could be summarised in the following results:

Mazzani and Margarita (1956) studied the branched sesame cultivars Inamar and Morada grown at 9 densities varying from 36630 to 200000 plant per ha. It was found that plant height of the first fruit on the plant varied little with different densities in both cultivars.