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PROGRESS REPORT FOR THE SECOND HALF / 1987

Grantee: Dr.R.Pathirana

Grant No. : RG/AID/10

Title of the project: "Collection and evaluation of sesame germplasm for breeding adapted, high yielding cultivars".

Date of award by IARES: 17th July, 1986.

Tel: 0412300

Department of Agronomy,  
Faculty of Agriculture,  
University of Ruhuna  
Kamburupitiya.

Rec'd in ... FEB 16 1988

## Field Studies:

### Experiments carried out in Yala 1987

#### Major yield trial of leading sesame varieties.

Twelve leading sesame cultivars were evaluated in a field trial with four replications in a RCB design. MI3 variety served as the control.

#### Induction of mutations and selection of useful traits.

M2 progenies of gamma - ray induced MI 2 were planted on M 1 plant to M2 row basis. Early maturity, 3 capsules per leaf axil ( MI2 has one capsule per leaf axil), late maturity, high yield (by capsule number) and other plants with changed morphological characters were selected for testing.

#### Combining ability analysis under two photoperiods.

Seven varieties from different origin and with different photoperiod reaction and their F1 progenies in all possible combinations were tested under two photoperiods (Normal yala day length and artificially shortened day length) in a factorial, strip plot design. Many characters at flowering and at harvest were studied on a single plant basis (10 plants per plot).

### Screening of 75 accessions for Fusarium resistance and biometrical characters

Seventy accessions were screened for Fusarium resistance in a Randomized Complete Block experiment with three replications. As the disease did not develop due to prevailing conditions, the trial was used to evaluate the cultivars for the Biometrical characters.

### Identification of insect pests of sesame

Twenty cultivars of different origin were grown in a RCB with three replications to identify insect pests and to screen the varieties for damage. Experiment was conducted with out spraying of insecticides.

### Studies on varietal response to soil moisture in sesame cultivars

A pot experiment was conducted to find out the response of four contrasting sesame cultivars to nine different soil moisture levels.

The cultivars tested were MI 3, MI 2, Instituto 71 and UCR 82 - 203 NS. The plants were grown in a specially constructed hut to control moisture in the soil by preventing rain water falling on pots.

### Hybridization and selfing

Hybridization programme was continued using different

combinations. 70 crosses were completed in Yala season, 1987.

On going experiments - Maha 1987/88

The following experiments have been established in the field.

Multiplication and renewal of seed stocks of collected germplasm

210 foreign and local accessions were planted in the field in single rows to obtain fresh, selfed seeds for the maintenance of the collection.

Growing of F1 generation to harvest F2 seeds

The F1 generation of 148 crosses were planted in two replications along with respective parent varieties to study the heterosis in F1 of different combinations and to harvest F2 seeds for the breeding programme. The dominant morphological characters are also being noted to find marker genes for a future hybrid sesame programme.

Another set of 55 F1 crosses were planted in single row unreplicated plots for obtaining F2 seeds.

Combining ability studies

All possible F1 crosses involving six contrasting varieties viz. MI2, MI3, Australian Introduction, Jori, Determinate and D7-11-1 were planted with the parent varieties in two replications to study the general and specific combining ability of the varieties and crosses. Different agronomically important characters are being studied.

Screening 100 cultivars for morpho-physiological and biometrical characters

One hundred accessions were planted in two replications in a RCB design to identify their yield characteristics and performance.

Screening and confirmation of mutants in M3 progeny testing

M3 seeds of 70 selected M2 plants were grown in single row plots with the parent variety MI2 at 10 row intervals. The variation for morphological, physiological and yield characteristics are being recorded.

Growing of M2 generation

The M2 seeds collected from more than 500 M1 plants were grown on progeny basis and single plant selections will be carried out at maturity.

Pilot experiment with two mutagens and three cultivars

Seeds of three cultivars were treated with EMS and dES in four concentrations. The treatment time was 12 hrs. and 24 hrs. for each concentration. One hundred seeds per treatment were planted in the field and in wooden boxes filled with soil. Germination, plant height, hypocotyl length and No of plants at two, four and six weeks after planting were measured. Experiment is being continued to collect M2 seeds. The survival of M1 plants in the field will be estimated.

#### GROWING OF M2 GENERATION

Seeds of M1-2 and were treated with 20,40 and 60 krad of gamma rays at CARI Gannoruwa using 60 Co source. The M1 generation is being raised.

#### VARIETY EVALUATION IN THE DRY ZONE

Fifteen leading cultivars selected from our germplasm were planted in 5 row plots in a RCB with three replications at the Tunkana Farm (near Embilipitiya) of the Mahaweli Authority to test their performance against recommended variety M12.

#### Hybridization

F1 seeds of three new diallel crosses, each involving six parents and two other diallel crosses of which F1 seeds are already available are being produced (Total 5 Diallels).

Isolated mutants are being crossed with original parent variety to study the inheritance of mutant characters.

Varieties identified as resistant are being crossed to high yielding cultivars.

#### Laboratory studies

##### Comparison of five nutrient media for Phytophthora spp.

The following media amended with ampicillin (250 mg/l, 500 mg/l) were used to culture Phytophthora spp.

Corn meal agar, Soya bean meal agar, Carrot agar, Tomato juice agar, Sesame leaf extract agar. 3x3 treatment combinations in 3 replicates were used.

##### Identification of fungal diseases of Sesame.

Samples or cultures isolated from diseased sesame plants were sent to CMI for identification.

Identification of Insect pests and their natural parasites

Samples of insect pests and their natural parasites were sent to C.A.B. International Institute of Entomology, London for identification.

Results and Discussion

Major yield trial

The experiment was statistically analysed for plant height, No of nodes to 1st flower, Internode length, No of capsules per plant and dry weight. None of the characters showed significant differences among treatments. However the tallest variety in the trial was Tainan white. Sudu Thala (RFA157) had the highest number of capsules per plant. Tainan White recorded the highest value for 1000 seed weight. Sudu Thala, MI 2 and Tainan White recorded the heighest yield in the experiment.

Combining ability analysis under two photoperiods.

Analysis of variance for strip plot design using day length as main plots and varieties as sub plots was completed for all the characters. Time taken to flowering recorded significant differences for day lengths, varieties and interaction. Australian introduction was found to be least affected by day length changes. Early to mature varieties such as Bjal sadowski and suwen 21 reacted more to change in day length than Australian introduction.

For other charaters varieties and interaction of day length with varieties were statistically significant.

The recommended variety MI 2 and Criolla de Falcon have given high values of General Combining Ability for many characters including seed yield and number of capsules. Additive effects were found to be more pronounced than dominance effect and the breeding programme will be planned accordingly.

Particular crosses have recorded high specific combining ability effects. Thus crosses Croilla de falcon x Determinate, MI 2 x Determinate and Determinate x Suweon 21 have recorded high SCA effects for yield characters. These crosses should give high yielding segregants. Crosses of Determinate with their varieties have already produced many intersting segregants in Israel (A. Ashri, personal communication).

Screening of 75 cultivars for Biometrical characters.

Varieties Jashbrouk, Oro Tall, A-5-13, Sesamum 55, D-7-11-1, Gouri, DT 1 and 180/52 recorded the highest yield. Highr number of branches and the tall stature of the plant are characteristic to these varieties.

Characters associated with early growth vigor had relation to

final yield.

Correlation and path analysis showed that the number of capsules had the highest direct effect on yield. High correlations of other characters are related indirectly to number of capsules.

Identification of insect pests of sesame

The insect pests positively identified are:

Lepidoptera: *Helicoverpa armigera* (Hubner)

*Chrysodeixis acuta* (Walker)

and *Antigastra catalaunalis*

Aphididae : *Aphis gossipii* Glover

The insect parasitising *C. acuta* has been identified as  
*Apanteles phytometrae* Wilkinson

Studies on water requirements of sesame.

The nine water regimes given are as follows. 70% of field capacity at seeding phase. Three treatments at vegetative phase viz 80% of field capacity, 60% of field capacity and irrigation at wilting point. Each of these three treatments were further subdivided into three at flowering and irrigation at wilting.

The varietal response was most marked on the treatments where irrigation regimes were different at flowering. The highest evapotranspiration rate during the vegetative and flowering phases was recorded in instinto 71. In this variety it was 9.7 mm/day and 12 mm/day in vegetative and flowering phases respectively.

The cumulative evapotranspiration in the treatments 80% of field capacity had the highest water consumption during the entire growth period for all the four varieties.

ET/EP ratio was low at the early phases and was high at flowering with the peak value at maximum flowering.

Although the total water consumption in the varieties M12, M13 and UCR82-203 was not significantly different, the water use efficiency was higher in M12 and M13 due to their higher yield.

Significant differences for plant height and number of branches were observed among varieties as well as among water regimes. Plants were taller in treatments grown at higher moisture levels. Branch number was higher in the treatments with higher moisture levels at vegetative phase.

The capsule number was reduced by 27-50% when the soil moisture level was reduced from 80-80 to WP-WP in different varieties.

Results clearly indicate that sesame is very susceptible to moisture stress at flowering but not at vegetative phase.

Expected results from Maha 87/88 trials.

F2 seeds of more than 200 cross combinations will be available for growing when the present F1 generation is completed.

Fresh, selfed seeds for trials and collection, will be available.

Combining ability of another set of varieties vis. MI2, MI3, Jori, Australian introduction, D7-11-1 and Determinate will be known.

New selections from mutation breeding trials will be available to increase the variability of the germplasm. The suitable doses of chemical mutagens EMS and dEs will be known for two adapted cultivars.

The performance of the leading cultivars in other growing areas will be known.

Results of Laboratory Studies.

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Comparison of five nutrient media for Phytophthora spp.

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Growth could be first observed on the 2nd day except in sesame leaf extract which took three days. Colony diameter initially was higher in Carrot agar (5.47) and Corn meal agar (5.23).

Sesame leaf extract agar significantly differed from other treatments. No significant differences were observed among other treatments. Considering all the growth parameters, carrot agar can be recommended as the best for culturing Phytophthora.

Diseases in sesame

Following disease causing organisms have been identified by C.M.I.

Botryodiplodia theobromae Pat.

Fusarium pallidoroseum (Cooke).

IS THE WORK ON SCHEDULE : Yes

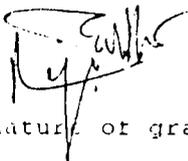
PLAN OF WORK FOR THE NEXT HALF YEAR

- Grow new germplasm if available
- Grow new local collections
- Grow parents F1 and F2 in a diallel cross of seven varieties and another diallel cross of six varieties

- Selections, F2 and backcrosses with adapted, high yielding cultivars
- Progeny testing of selected mutants
- Study segregation for different characters in crosses
- Study new diallel crosses (P and F1)
- Screening of more germplasm for resistance to Phytophthora
- Grow M2 generation of gamma-ray and chemical mutagen treated M1 2 and TMV 3 x T 65 varieties
- Collection of local germplasm
- Visit to collaborator's project (Thailand)
- Reports, Journal articles.

Any other remarks:

Three papers were presented at the recently concluded Annual Sessions of the Sri Lanka Association for the Advancement of Science (December, 1987).  
Grantee participated in a sesame consultants meeting at I.A.E.A head quarters in Vienna. This consultancy was sponsored jointly by the FAO and IAEA.  
A paper was presented at the 2nd International Conference on Quantitative Genetics at North Carolina, USA in June 1987.  
Two undergraduate students completed their final year research reports, in partial fulfillment of the requirements of the B.Sc. (Agric.) degree, working in the project.



Signature of grantee:

Comments of the Head of Department:

Work of the project during the second half/1987 was carried out according to the schedule. Project report is in order. Recommended and forwarded.

Signature of Head of Department:

  
13/01/88 Dr. K. D. N. Weerasinghe  
Head / Agronomy

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Head / Agronomy.