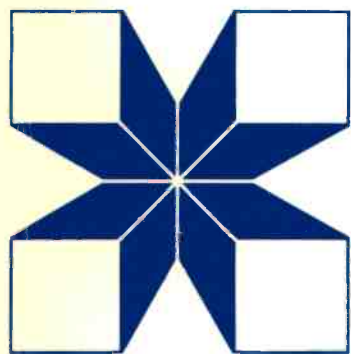


ARCHIV
OMRAN
53264

IDRC
CRDI
CIID



C A N A D A

OIL CROPS: SESAME AND SUNFLOWER SUBNETWORKS

PROCEEDINGS OF THE JOINT SECOND
WORKSHOP HELD IN CAIRO, EGYPT,
9-12 SEPTEMBER 1989

The International Development Research Centre is a public corporation created by the Parliament of Canada in 1970 to support research designed to adapt science and technology to the needs of developing countries. The Centre's activity is concentrated in six sectors: agriculture, food and nutrition sciences; health sciences; information sciences; social sciences; earth and engineering sciences; and communications. IDRC is financed solely by the Parliament of Canada; its policies, however, are set by an international Board of Governors. The Centre's headquarters are in Ottawa, Canada. Regional offices are located in Africa, Asia, Latin America, and the Middle East.

Le Centre de recherches pour le développement international, société publique créée en 1970 par une loi du Parlement canadien, a pour mission d'appuyer des recherches visant à adapter la science et la technologie aux besoins des pays en développement; il concentre son activité dans six secteurs : agriculture, alimentation et nutrition; information; santé; sciences sociales; sciences de la terre et du génie et communications. Le CRDI est financé entièrement par le Parlement canadien, mais c'est un Conseil des gouverneurs international qui en détermine l'orientation et les politiques. Établi à Ottawa (Canada), il a des bureaux régionaux en Afrique, en Asie, en Amérique latine et au Moyen-Orient.

El Centro Internacional de Investigaciones para el Desarrollo es una corporación pública creada en 1970 por el Parlamento de Canadá con el objeto de apoyar la investigación destinada a adaptar la ciencia y la tecnología a las necesidades de los países en desarrollo. Su actividad se concentra en seis sectores: ciencias agrícolas, alimentos y nutrición; ciencias de la salud; ciencias de la información; ciencias sociales; ciencias de la tierra e ingeniería; y comunicaciones. El Centro es financiado exclusivamente por el Parlamento de Canadá; sin embargo, sus políticas son trazadas por un Consejo de Gobernadores de carácter internacional. La sede del Centro está en Ottawa, Canadá, y sus oficinas regionales en América Latina, África, Asia y el Medio Oriente.

This series includes meeting documents, internal reports, and preliminary technical documents that may later form the basis of a formal publication. A Manuscript Report is given a small distribution to a highly specialized audience.

La présente série est réservée aux documents issus de colloques, aux rapports internes et aux documents techniques susceptibles d'être publiés plus tard dans une série de publications plus soignées. D'un tirage restreint, le rapport manuscrit est destiné à un public très spécialisé.

Esta serie incluye ponencias de reuniones, informes internos y documentos técnicos que pueden posteriormente conformar la base de una publicación formal. El informe recibe distribución limitada entre una audiencia altamente especializada.

**OIL CROPS:
SESAME AND SUNFLOWER SUBNETWORKS**

**Proceedings of the Joint Second Workshop
held in Cairo, Egypt, 9-12 September 1989**

Edited by
Abbas Omran
Technical Adviser, Oil Crops Network



Organized by
Agricultural Research Centre, MOA, Giza, Egypt
and
International Development Research Centre, Canada

Sponsors
Food and Agriculture Organization, Industrial Crops and European Office, Rome
International Bureau of Plant Genetic Resources, Rome
International Development Research Centre, Canada

Scientific and Organizing Committee
Dr Abbas Omran
Dr Badr A. El-Ahmar
Dr Eglal Rashed

ARCHIV
OMRAN
no. 2

Material contained in this report is produced as submitted and has not been subjected to peer review or editing by IDRC Communications Division staff. Unless otherwise stated, copyright for material in this report is held by the authors. Mention of proprietary names does not constitute endorsement of the product and is given only for information.

FOREWORD

In September 1989, the Sunflower and Sesame subnetworks held their bi-annual meetings in Cairo, Egypt. The meetings were well attended and papers, presented in these proceedings, provide a very informative overview of some of the cropping systems, management practices, production constraints and research highlights for both crops in several countries.

Chronic edible oil deficit is a major problem facing many developing countries in Africa and Asia where most countries are forced to import large quantities to satisfy the requirements of their growing populations. With the present rates of population increase and the improvement of nutrition standards it is likely that the consumption of edible oil will rise over the years, increasingly drawing on scarce foreign exchange for the importation of this vital food staple. For this reason, several countries have opted to increase self-sufficiency in edible oil.

Production deficits are due to a number of factors, among which neglect in oilcrops research, in both developed and developing countries has been a major one. This is particularly true for minor crops such as sesame. In the context of the IDRC oilcrops network, initiated in 1981, the interchange of information and the sharing of results between scientists have proved to be very useful and beneficial for the generation of scientific knowledge and the stimulation of research in this important area. It is hoped that conclusions and recommendations of this meeting will stimulate further research and development in the future.

A second important reason for limited national production has been the exceptionally low levels of world prices for oils and fats in the 1980's and the comparative advantage of importation over production for developing countries. The description of a case study using a system's approach to analysis the Vegetable Oil/Protein System of Kenya has stirred much interest during the Cairo meetings and it is hoped that similar work can be carried out in other countries in the future.

The Cairo meetings will also unfortunately be remembered as the one which has witnessed the diagnosis of the fatal disease of late Dr. Hiruy Belayneh, Chairman of the Brassica Subnetwork. We will all regret his absence.

On behalf of IDRC and of all participants, I would like to thank the Government of Egypt for its hospitality, the organizers for the excellent arrangements and all those who contributed to the success of these meetings by their presentations and discussions.

Eglal Rached,
Senior Program Officer,
IDRC, Cairo

CONTENTS

	PAGE
Forward.....	iii
List of Participants.....	vi
Introduction.....	ix

Part 1. SESAME SUBNETWORK - II

Sesame Genetic Resources: Collection, Evaluation and conservation.	
AMRAM ASHRI.....	2
Sesame Research in the Sudan.	
MOHAMED EL-HASSAN AHMED.....	10
Progress in Sesame Research in Ethiopia.	
HIRUY BELAYNEH, BULCHA WEYESSA AND ELIAS URAGE.....	13
A Brief Outline of Sesame (<i>Sesamum Indicum</i> L.) Research in Tanzania.	
J.Y CHAMBI AND E.M. KAFIRITI.....	17
Scope of Sesame (<i>Sesamum Indicum</i> L.) in Pakistan.	
MUHAMMAD ASLAM, MASOOD A. RANA AND M. SIDDIQUE MIRZA..	21
Status of Sesame as Oilseed in Bangladesh.	
M.A. KHALEQUE AND HASINA BEGUM.....	24
Problems and Progress of Sesame Production In india.	
S. THANGAVELU, G. KANDASAMY, M. SIVANADAM AND R.K. MURALI BASKARAN.....	27
Pests of Sesame and their Control.	
S. THANGAVELU.....	31
Review and Prospects on Sesame Production in China.	
TU LICHUAN.....	41
Sesame Irrigation in Egypt.	
AHMED MOHAMED EL-WAKIL.....	44
Agronomic Studies on Growth, Yield and Yield Components of Sesame.	
SAMIR TAHA AND MOHAMED EL-SROGY.....	48
Sesame Research and Progress in Egypt.	
NESSIM R. GUIRGUIS.....	52
Root-Rot and Wilt Diseases of Sesame in Egypt.	
A.A EL-DEEB.....	55
Highlights on Improving Production of Sesame in Egypt.	
A.F. IBRAHIM	59
Evaluation of Some Cultivars and Promising Strains of Sesame (<i>Sesamum indicum</i> L.).	
A.A. EL-SHIMY AND M.Z. EL-HIFNY	61

Part 2. SUNFLOWER SUBNETWORK - II

Use of Wild Species in Sunflower Breeding.	
DRAGON SKORIC.....	70
Sunflower Breeding: General Objectives and Recent Advances.	
JOSE FERNANDEZ MARTINEZ.....	95
Progress in Sunflower Research in Ethiopia.	
HIRUY BELAYNEH	102
Sunflower Adaptation in Morocco.	
S. QUATTAR, T.E. AMEZIANE AND A. BAIDADA	106

Effect of Maturity Stages and Desiccant Application on Yield, Oil Content and Oil Quality of Sunflower. MASOOD A. RANA, CHAUDHRY A.OZAIR, M. AYUB KHAN AND SHAFIULLAH	114
Trends and Strategy of Sunflower Production in Pakistan. MASOOD A. RANA	125
Sunflower Production in India - Problems and Prospects. M. RAI AND P.S. BHATRANGAR.....	128
Twelfth International Sunflower Conference - A Report. MANGALA RAI	135
Status of Sunflower as Oilseed in Bangladesh. M.A. KHALEQUE, AND S.H. MIRZA	142
Some Aspects Towards Overcoming Vegetable Oils insufficiency in Egypt: Production of Sunflower and its Improvement in Suez Canal Region. ABDEL-FATTAH MOHMED ABDEL-WAHAB.....	144
Response of Sunflower to Nitrogen Application and Plant Population Density Under Irrigation at Giza, Egypt. SALWA I. EL-MOHANDES.....	155
Sunflower Research and Production in Egypt. BADR A. EL-AHMAR.....	158
Performance of a New Synthetic Sunflower Stock Developed From Local and Introduced Germplasm and Further Improvement Via Population Improvement Method. R. SHABANA	163
Response of Sunflower and Associated Weeds to Some single and Tank Mixed Herbicides. A.F. IBRAHIM, Z.R. YAHIA, H.R. EL-WEKIL AND E.D.ABUSTEIT.....	167
Report on Sunflower Production In Dakahlia Governorate, Egypt. S.E. EL-KALLA.....	168
Studies of Diallel Cross in Sunflower (<i>Helianthus. annuus</i> L). KHALED HAMMAD.....	171
Effect of Some Intercropping Patterns of Sunflower/Soybean on Yield, Yield Components and Land Usage in Egypt. M.A. MADKOUR	175
Sunflower Diseases in Egypt. ARAFA A. HILAL	180

Part 3. GENERAL

The Vegetable Oil/Protein System Program: The Kenyan Experience. CARLOS ZULBERTI.....	184
Microbial Control of Lepidopterous Pests of Oilseed Crops. H.S. SALAMA.....	203
Sunflower and Sesame Research in the Philippines. NENITA M. TEPORA	206

Part 4. DISCUSSIONS AND RECOMMENDATIONS

Discussions and Recommendations	213
I. Sesame.....	213
II. Sunflower.....	218
III. General	223

MICROBIAL CONTROL OF LEPIDOPTEROUS PESTS OF OILSEED CROPS

H.S. Salama

In the present studies, a series of experiments were conducted to evaluate the potency of some fifty strains of *Bacillus thuringiensis* (*B.t*) against larvae of two major pests of oil crops, namely, greasy cut worm (*Agrotis ypsilon*) and cotton leaf worm (*Spodoptera littoralis*). The bacterial cultures were first grown aerobically on a rotary shaker using either fodder yeast or ground kidney beans media. The harvested Endotoxin preparations were bioassayed for their potency against 2nd and 3rd instar larvae of *A. ypsilon* and *S. littoralis*, respectively. The bioassays were carried out under standard conditions on larvae fed on castor oil leaves dipped in Endotoxin suspensions at 500 ug/ml level. Proper controls were run simultaneously.

With respect to *A. ypsilon*, several cultures of var. *Aizawai* (amongst which were HD-130, HD-128, HD-228, HD-593 and HD-865) proved to be active against this insect pest. Within the var. *galleriae*, HD-210 and HD-234 were effective. In addition, two strains of var. *kurstaki*, HD-341 and HD-263 as well as HD-703 of var. *Thuringiensis* were also highly active against the same insect pest. The most effective strains against *A. ypsilon* were HD-130, (var. *Aizawai*), HD-703 (var. *Thuringiensis*), HD-134, (var. (*Aizawai*) and HD-341 (var. *kurstaki*) giving LC_{50} values of 15.3, 22.6, 26.0 and 46.5 ug/ml, respectively, as compared to 3640 ug/ml of the HD-1-1-1980 standard.

When the *B. thuringiensis* strains were screened against third instar larvae of *S. littoralis*, several cultures of var. *Aizawai* notably HD-134, HD-593, HD-113 and HD-282 were highly active. Furthermore, some other cultures were also effective notably HD-554 (var. *Canadensis*), HD-

234 (var. *galleriae*), HD-263, HD-341, HD-89 (var. *kurstaki*), in addition to HD-110 (var. *Entomocidus*) and HD-96 (var. *Thuringiensis*). The most potent strains were HD-593, HD-110, HD-263 and HD-554 giving LC_{50} values of 22.0, 27.4, 35.7 and 37.5 ug endotoxin/ml, respectively as compared to 2160 ug/ml for HD-1-1980 standard preparation.

In the second phase of the present work, studies were conducted to search for possible biochemical means to enhance the potency of the bacterial Endotoxin preparation against *A. ypsilon* as plausible means to increase the feasibility of application and lowering the field spraying costs. Thus, a number of simple chemical compounds were used in conjunction with low levels of endotoxin preparation of *B.t.* var. *Galleriae* HD-234 (125 ug/ml). These groups of compounds included selected divalent salts of Calcium, zinc and Copper; some salts of Potassium and Sodium; a group of organic acid salts as well as some protein-solubilizing agents. Appropriate controls were run simultaneously, and the cotoxicity factor (CF) in each case was calculated to elucidate the type of the resulting interaction. Within the divalent cations tested, a clear enhancing effect on the potency of the Endotoxin was noted for the calcium salts with CF ranging between 43 and 72 depending on the salt tested. However, among this divalent group of salts, Zinc sulfate recorded the highest CF value reaching 84 whereas copper salts were also potentiative but demonstrated notable toxicity when tested alone against the target insect. The LC_{50} values of the Endotoxin (138.2 ug/ml) was lowered to 29.7, 29.9, 37.1 and 39.5 ug/ml in the presence of Calcium carbonate (0.1%), Hydroxide (9.1%), Acetate (0.05%) and Nitrate (0.1%),

respectively. Copper carbonate, Copperoxide and zinc sulfate lowered LC_{50} to 9.5, 13.8 and 18.7 ug/ml, respectively (conc. 0.05-0.1%).

Within mono-cationic salts tested, Potassium carbonate exhibited high potentiating effect with CF value of 55 and lowering the LC_{50} value of the endotoxin to 7.6 ug/ml when added at 1% concentration to the dipping solution. Among the mono-carboxylic acid salts tested, those of short-chained acids proved to be highly potentiating for the endotoxin effect on the target insect. Thus, CF values of formate and acetate were 92 and 91, respectively. The highest CF value obtained for this group of compounds was 127 recorded for acetamide added at 1% final concentration.

Some dicarboxylic acid salts exhibited high potentiative effect, e.g., malate, tartarate and fumarate yielding CF values of 96, 78 and 72, respectively. In the presence of the potentiative organic acid salts, the LC_{50} values of the endotoxin preparation were reduced drastically. Thus, the LC_{50} values in the presence of acetamide (1%), fumarate (0.5%), malate (0.5%) and tartarate (0.1%) were 7.4, 47.5, 48.4 and 49.4 ug/ml, respectively.

In addition, some protein-solubilizing agents, e.g., EDTA, urea, and sodium thioglycollate were also potentiative for the endotoxin resulting in CF values of 100, 75 and 71, respectively. In the presence of these compounds, LC_{50} values were lowered to 15.6, 80.8 and 55.3 ug/ml in the same respective order.

In the next phase of the studies, 21 amino acids and amides were tested as possible potentiators for endotoxin preparation of B.t. var. *Galleriae* HD-234 against larvae of *A. ypsilon*. The amino acids were selected to represent different classes including aliphatic, branched, aromatic, cyclic, basic as well as acidic amino

acids. These compounds were incorporated in the dipping solution both alone and in conjunction with the endotoxin suspension in final concentrations of 0.05%. Proper controls were run simultaneously. A notable potentiative effect was noted for some aliphatic amino acids including DL-serine and DL-alanine where CF values amounted to 91 and 86 with LC_{50} reduced to 52.8 and 33.9 ug/ml, respectively, as compared to 240.7 ug/ml for the endotoxin preparation only. Within the branched amino acids, L-valine was the most potent activator of the endotoxin with CF value of 86 and lowering LC_{50} of the endotoxin to 33 ug/ml. Among the basic amino acids and amides, L-arginine was the most effective potentiator followed by DL-ornithine, L-asparagine and DL-glutamine with CF values of 110, 93, 91 and 88 accompanied by reduction of the LC_{50} value to 6.0, 12.0, 9.2 and 83 ug/ml, respectively. The acidic amino acids, L-aspartic and L-glutamic, were also potentiative but to a lesser extent than their amide forms. The indole-containing DL-tryptophan and the cyclic L-proline amino acids were also highly effective potentiators with CF values corresponding to 90 and 92 with a capacity to lower LC_{50} value to 14.9 and 7.7 ug/ml, respectively. On the other hand, the sulfur-containing amino acids tested could not exhibit any potentiation of the endotoxin under study. On the contrary, L-cysteine and L-cystine were antagonistic to the potency of the endotoxin and recorded negative CF values. The obtained results were discussed in the light of their scientific as well as application merits in the field of biological control of pests of oilseed crop.

Fifty nine cultures belonging to 12 different vars. of B.t were screened for the production of B-exotoxin. A devised medium was used for maintenance of the cultures. The activity of the B-exotoxin preparation of different B.t. cultures was evaluated for *A. ypsilon*

and *S. littoralis*, compared to the standard preparation, thuringiensin. The results showed that some B.t. cultures were able to produce large amounts of B-exotoxin, such as vars. *Kenya* HD-588, *Galleriae* HD-129, *Toloworthi* HD-301 and *subtoxicus*. Some field tests were carried out to assess the effect of spraying B-exotoxin against *S. littoralis* on peanuts and the results were encouraging but they need further conformation.

B.t var. *Kurstaki* HD-1 (Dipel 2x), as a biological insecticide was tested against *S. littoralis*, larvae infesting soybean plants either alone or combined with potassium carbonate as an adjuvant. The carbamate chemical insecticide, Lannate, was used for comparison. The materials were applied either through spraying or dusting. Results showed that potassium carbonate enhanced and significantly increased the effect of Dipel. Both techniques are suitable for use in control application. The recommendation of using a combination of Dipel at 250 gm/faddan and potassium carbonate at 150 g/faddan is advisable. This combination gave significantly high larval reduction (96.86% and 92.11% with an increase of 2.50 and 1.60 folds in yield after spraying and dust applications, respectively. The data also suggested that a combination of Dipel and potassium carbonate (Dipel + K_2CO_3) might be an effective component of the future *S. littoralis* IPM programs on soybeans.

Field tests were conducted to determine the effectiveness of wheat bran baits based on *B.t* var. *kurstaki* HD-1 (Dipel 2x) compared to the organophosphorous insecticide, Hostathion, against the greasy cutworm (*A. ypsilon*) on faba bean (*Vicia fabae*). Significant larval reductions were observed in all treated plots after one application with a significant increase in the yield (1.45-1.60 folds) compared to the control plots. The yield was not affected by varying dose of Dipel in the bait between 150 and 250 gm/f. The addition of the adjuvant, potassium carbonate, to the Dipel bait caused a significant larval reduction, 10 days after application and showed to be as efficient as baits based on Hostathion.

In the third series of experiments, application of Dipel 2x at a rate of 250 g/f was effective against the larvae of *S. littoralis* (1st to 4th instars), while larvae in older stages (5th and 6th instars) were more resistant. Lannate was highly effective against young and old larvae. The addition of potassium carbonate to Dipel increased larval mortality. In Sharkia governorate, the yield of soybean increased significantly when the infested areas were treated once by Dipel 2x or Lannate with 1.113 fold increase. In Menoufia governorate, also, when soybeans were treated three times with Dipel 2x or Lannate, yield increased 2.031-2.066 times. This difference in yield gives a higher net profit to the farmer exceeding the costs of spray applications.