Personal Information

Name: Dr. Mohammed Saeed Ali El-Sarrag
Date of Birth: 27th August 1944
Place of Birth: Omdurnan, Sudan
Nationality: Sudanese
Marital Status: Married with 5 children
Academic Rank: Professor
Present Address: Dept. of crop Protection, Faculty of Agriculture, University of Khartoum, P.O. Box 32 Khartoum North, Sudan.
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Academic Qualifications

1. B.Sc. (Agric.), Faculty of Agriculture, Alexandria University, Average Grade “Excellent” with Honours, 1967, Egypt.
2. M.Sc. (Agric.), Faculty of Agriculture, University of Khartoum, 1971, Sudan. Title of the Thesis: Studies on Spodoptera exigua HB. (Lepidoptera: Noctudiae), a pest of Medicago sativa (Berseem).
3. Ph.D. (Agric.), Faculty of Agriculture, Cairo University, 1977, Egypt. Title of the Thesi

Academic Rand and Administrative Contribution

A) Academic Rank:
1. Academic Staff Member, Crop Protection Department, Faculty of Agriculture, University of Khartoum from January 2001 till now, Professor.
2. Academic Staff Member, Plant Protection Department, College of Agriculture King Saud University fro 1.9.1988 till 1.7.1997, Associate Professor.
3. Academic Staff member, Crop protection Department, Faculty of Agriculture, University of Khartoum, from 1.7.1989, Assistant Professor.
4. Academic Assistant, Crop Protection Department, Faculty of Agriculture, University of Khartoum, from 1.4.1977.
(B) Administrative Positions:
1. Expert, Arab Organization for Agricultural Development, Arab League from 1.8.1985 till 30.7.1988.
2. Deputy, Dean of Student, Khartoum University from 1.9.1978 till 1.10.1979.
3. Assistant Field Inspector, Khasm Al-Girba Agricultural Scheme, Sudan from 1.8.1967 to 1.4.1968.
(C) Prizes and Honours
1. Honorarium course in North Carolina State University for 6 weeks (April/May 1985) sponsored by the Near-East Foundation, New York, U.S.A.
2. Honorarium course in Kenya (Ministry of Agriculture) and Great Britain (International Bee Research Association) for 2 weeks (October, 1981). Sponsored by the Organization of African Unity, Nairobi, Kenya.
Teaching,

Training and Promotion

(A) Teaching

1. I spent 42 years in teaching since my appointment as a lecturer in 1977. During this period I shouldered and contributed to the development and betterment of the Department of Crop Protection, Faculty of Agriculture and the University of Khartoum in different areas.

(a) I shouldered in teaching the following undergraduate courses Zoology 101, General Entomology 201, Apiculture 331, Medical Entomology 303, 332 and Crop Protection 341 during the academic years 1977/1985 and 1998 to date according to the scheduled time table of the Department of Crop Protection, University of Khartoum.

(b) For the first time in Sudan, I submitted a proposal beekeeping course to the Senate of the University to be approved in the syllabus for the students of Crop Protection Dept., Faculty of Agriculture in the academic year 1980.

(c) All Graduate students are eligible to prepare the following essays in the field of Apiculture under my supervision (Please see annex 1) (M.Sc. by research).

(d) I whirred in a post-graduate course Vertebrates and Invertebrates (M.Sc. by courses) for 6 years. 2004/2010.

(e) Teaching commitment was officially added to train employees of the ministry of Education for full academic year in applied apiculture in the Faculty of Agriculture, University of Khartoum during 1981 and 1982. (2 hours lecture and 2 hours practical – average enrollment 45 students annually).

(f) I shared the Faculty of Education, University of Khartoum in teaching Biology and Entomology courses during two academic years 1979/1980 and 1980/1981.

(g) I shared Extra Rural Studies (U. of K.) in teaching Apiculture Diploma courses during three academic years 2005/2006/2007/2008.

(h) I submitted a curriculum for an M.Sc. (Apiculture) degree by courses and research for Sudan Academy of Sciences (2008).

(B) Training

1. On my return (1977), I submitted a proposal to improve beekeeping in Sudan to the National Council for Research (NCR). We started with the reconstruction of the Apiary of the Faculty of Agriculture and the sponsorship of the first two Post-graduate studies (M.Sc.) on Apiculture in the University of Khartoum. Until now 15 graduate students (M.Sc. & Ph.D.) were trained in Apiculture and successfully

completed their work and awarded their degree.
2. In 1980 I conducted a thorough survey for suitable localities to establish modern apiaries. This culminated among other things on a submission of a project proposal to FAO to establish beekeeping unit in Northern Sudan. Such project was anticipated to train farmers and to produce honeybee products in addition to provision of package bees and queen honeybees.
3. In 1981 another proposal was submitted to the Near East Foundation – New York (NEF) to assist in promoting modern beekeeping industry in Sudan. This proposal was accepted and NEF began its involvement in collaboration with the NCR. Additional apiary and a small laboratory were constructed in the Faculty of Agriculture, University of Khartoum.
Simultaneously, an experimental modern apiary was established in the Gezira Research Station.
In Northern Sudan, other two apiaries were established in joint collaboration between the ministries of Agriculture in Egypt and Sudan in 1984/1987.
In 1985 the first modern commercial apiary was established in Eastern Sudan sponsored by the UNHCR. Two years later the UNHCR founded another commercial unit in El-Suki Agric. Scheme.
All these modern apiaries were established in potential beekeeping areas to serve as demonstration centres for training interested farmers and traditional honey hunters.
4. During this period 1980/1985, I acted as the Sudan National Beekeeping Project leader. Under the umbrella of this project training of post-graduate students and research work covering different topics were conducted.
4.1 Morphometrical studies of the Sudanese honeybees (Rashad and El Sarrag, 1980 and 1983, Saeed, 1981; Mohamed 1982; Rashad et al., 1984; Mogga, 1988 and El Sarrag et al., 1992).
4.2 Behaviour, biology and management of the bees under different conditions (Gasma 1982, El Sarrag, 1979 and 1984; Garcia 1984, Ambrose 1985 and El Sarrag 1991).
4.3 Breeding programmes of the honeybees in Sudan (Nagi 1984; El Sarrag and Nagi 1984; Nagi 1988 and El Sarrag and Nagi 1989).
4.4 Compositional studies for Sudanese honeys (Ibrahim 1985).
4.5 Pharmacological studies on honey, Venom, Royal Jelly and Propolis (Wadi 1986, El Tahir et al., 1986, 1998a, 1998b and Al-Mufarrej and El Sarrag 1997).
4.6 A comprehensive integrated farming system (Hassan 1988, Musa 1988, Ahmed et al., 1989, Musa et al., 1989 and El Sarrag et al., 1993).

4.7 Pests and diseases attacking Sudanese honeybees (El Sanousi et al., 1987 and Mohamed El-Kheir 1988).
4.8 Moreover, four technicians from different Agricultural Departments were trained in apiculture for a month in the Faculty of Agriculture, University of Khartoum during 1981/82).
4.9 A three-week beekeeping training course for 13 technicians was held at central Sudan. Each of these technicians is now serving a small modern apiary.
4.10 Other ad-hoc training courses for interested farmers were held in different areas with high potential for beekeeping. Many of the trained farmers were helped to establish small apiaries.
4.11 Four technicians were trained in apiculture for six months in Egypt during 1977 to assist in the promoting programmes of apiculture in Sudan. Another technician was also trained for 9 months in Cardiff, U.K. for the same purpose.
(C) Promotion
1. During 1978/1979 I acted as Deputy Dean of Students in the University of Khartoum. I worked closely with my colleagues in the Deanship of students to promote life and welfare of students. We constructed separate hostels for female students in Shambat, Medicine and Education campuses.
Moreover, the number of students benefited from the bursary increased from 150 to 1350 students. We tried to promote the link between our University of King Saud and Kuwait Universities and other areas of the same nature.
2. During 1985/1988 I acted as a expert of Apiculture in the Arab Organization for Agricultural Development (AOAD), Arab League. During this period:
2.1 I shared in a regional study for promoting beekeeping industry in the People's Democratic Republic of Yemen (PDRY) which was then sponsored by the Development Islamic Bank in Jeddah.
2.2 We constructed a number of demonstration apiaries, together with their manipulation and management for three successive years.
2.3 We constructed and managed a beekeeping research unit.
2.4 We provided many equipment, materials, chemicals and honeybee colonies.
2.5 A number of training courses were held in most Governorates of PDRY.
2.6 A complete book was written including original research work and observations for promoting Yemeni bee culture.
2.7 As a result of this project foreign trade of PDRY in honey raised up from US$ 2 million in 1985 to US$ 4 million in 1986 o US$ 9 million in 1987.
2.8 I acted as an expert f Apiculture in AOAD and surveyed Djibouti three times 1985 and 1988. I prepared a number of studies for promoting beekeeping

industry. A full programme was adopted and sponsored by AOAD including apiary construction, training and management.

2.9 I prepared a feasibility study on beekeeping promotion in Somali Democratic Republic which was accepted to be sponsored by the Development Islamic Bank in 1988.

2.10 I prepared a questionnaire followed by a complete book of apiculture promotion in all Arab Countries published in 1988 by AOAD.

3. During 1987 I acted as the Chairman of SUBA “Sudan Bee and Agriculture Voluntary Association”. This association seeks to promote improvement in the quality of life for rural residents through various activities generating incomes. The association focuses on the development of a viable beekeeping industry through working with farmers and native beekeepers. In its phased programmes, the following is going on: (1) establishment of two production apiaries; (2) working with thirty farmers in their own apiaries; (3) providing the required resources (home-made equipment, technical assistance, credit, bees,…etc.) and (4) helping in increasing production and marketing capabilities for the native beekeepers.

4. During 1988 until 1997 I worked in the Kingdom of Saudi Arabia, King Saud University, College of Agriculture, Dept. of Plant protection (Please see my academic load annex II).

5. During 1999 I prepared a project proposal for the promotion of the beekeeping industry in Sudan to assist in solving the increasing difficulties of this viable industry. This proposal presented to the Environment and Natural Resource Research Institute (ENRRI). This project may provide a good potential for significant contribution to strengthening Sudan capabilities in science and technology. It would be a starting point for a regional institute of apiculture that aid in the intrinsic Arab and African global strategy. Moreover, a large number of students, post-graduates, technicians and interested people can benefit from it since it has a rich potential for successful application of its results and it has a revolving funds.

Publications

A) Academic work published in refereed scientific journals

1. El-Sarrag, M.S.A. (1970). Persistence of Insecticides and Environmental Contamination. Sudan Agric. Mag. (10): 37-40.
2. El-Sarrag, M.S.A. (1971). Dangers of poisonous chemical substances and their control. Sudan Agric. Mag. (11): 89-94.
3. El-Sarrag, M.S.A. and El-Beshir, S. (1973). Laboratory and field evaluation of some insecticides for use against Spodoptera exigua Hb. Sudan Agric. J. (18): 5-13.
4. El-Sarrag, M.S.A. and El-Khidir, E. (1974). Biological studies on Spodoptera exigua Hb. Sudan Agric. J. (9): 5-9.
5. Rashad, S. and El-Sarrag, M.S.A. (1978). Beekeeping in Sudan. Bee World 59(3): 105-111.
6. Al-Sanousi, S.M.; El-Sarrag, M.S.A. and Mohamed, S.E. (1987). Properties of Serratia marcescens isolated from diseased honeybee larvae. J. Microbiology 133: 215-219.
7. El-Sarrag, M.S.A. (1985). Feasibility study on beekeeping promotion in PDRY. Arab Organization for Agricultural Development, Khartoum.
8. El-Sarrag, M.S.A. (1988). Feasibility study on beekeeping promotion in Djibouti. Arab Organization for Agricultural Development, Khartoum.
9. El-Sarrag, M.S.A. (1988). Feasibility study on beekeeping promotion in Somali Democratic Republic. Arab Organization for Agricultural Development, Khartoum.
10. El-Sarrag, M.S.A. (1991). Temperament of Sudanese honeybees. J. King Saud Univ, Vol. 3, Agric. Sci. (2), pp 263-267 (1411/1991).
11. El-Sarrag, M.S.A.; Saeed, A.A. and Hussein, M.A. (1992). Morphometrical study of the Sudanese honeybees. J. King Saud Univ. Vol. 4/1), pp. 99-108. (1412/1992).
12. El-Sarrag, M.S.A. (1993). Some factors affecting brood rearing activity in honeybee colonies in the cental region of Saudi Arabia. J. King Saud Univ. Vol. 5, Agric. Sci. (1), pp 97-108. (1413-1993).
13. El-Sarrag, M.S.A.; Ahmed, H.M. and Siddig, M.A. (1993). Insect Pollinators of certain crops in the Sudan and the effect of pollination on seed yield and quality. J. King Saud Univ. Vol. 5, Agric. Sci. (2), pp. 253-262 (1413/1993).
14. Abu Tarhoush, H.M.; Al-Kahtani, H.A. and El-Sarrag, M.S.A. (1993). Floral-

type Identification and Quality Evaluation of Some Honey Types. Food Chemistry, 46: 13-17.
15. El-Sarrag, M.S.A. (1993). Studies of some factors affecting rearing of queen honeybees (Apis mellifera L.) under Riyadh conditions. Res. Bull. No. 41, Agric. Res. Center, King Saud Univeristy. (1414/1993).
16. El-Sarrag, M.S.A.; Salem, M.S. and Ewies, M.A. (1994). Seasonal variation in oxygen consumption of workers of certain races of honeybees. J. King Saud univ. Vol. 6, Agric. Sci. (1), pp. 143-148. (1414/1994).
17. El-Tahir, K.E.H.; El-Sarrag, M.S.A. and ageel, M. (1996). Pharmacology of Honeybee Products: I. Action of Propolis on Rat Arterial Blood Pressure, Respiratory Systems and some Smooth Muscles. Saud Pharmaceutical Journal. Vol. 4, No. 3-4, July-October 1996, pp 157-164.
18. Al-Mufarrej, S.I. and El-Sarrag, M.S.A. (1997). Effects of Royal Jelly on the Humoral Antibody Response and Blood Chemistry of Chickens. J. Appl. Anim. Res. 12(1997): 41-47.
19. El-Tahir, K.E.H.; El-Sarrag, M.S.A. and Ageel, M. (2009). The Pharmacology of Honeybee Product: 2. Actions of Royal Jelly on the Cardiovascular System, Smooth Muscles and platelets of the Rat. (Accepted for publication on the Sudan Medical Journal).
20. El-Tahir, K.e.H.; El-Sarrag, M.S.A. and Ageel, M. (2009). The Pharmacology of honeybee Products: 3. Action of Bee venom on the Cardiovascular, Respiratory and some Smooth Muscles. (Presented for publication).
21. El-Sarrag, M.S.A. and El-Sayed, A.M. (2010). Effect of propolis and saline dressing materials on grade I diabetic foot ulcer. (Accepted for publication in the Sudan Medical Journal).
(B) Refereed Academic Work Presented at Scientific Conferences and Published in Proceeding
22. Rashad, S. and El-Sarrag, M.S.A. (1980). Some Characters of the Sudanese Honeybees Apis mellifera L. Proc. Conf. Apic. Trop. Climates. New Delhi, March, 1980).
23. Rashad, S. and El-Sarrag, M.S.A. (1983). Some Characters of the Sudanese Honeybees and their Hybrids. The XXIX Int. Beekeeping Conf., Apimonida, Bucharest, Romania.
24. El-Sarrag, M.S.A. and Nagi, S.K.A. (1984). Some Factors Affecting Rearing of Queen Honeybees in Shambat Area, Sudan. Proc. 3rd Int. Apic. Trop Climates, Nairobi, Kenya.
25. El-Sarrag, M.S.A. and Nagi, S>K>A. (1986). Historical Background of

Beekeeping in Sudan. 3rd Arab Con. Crop Protection, Syria.
26. El-Sarrag, M.S.A. and Nagi, S.K.A. (1989). Studies on Some Factors Affecting Mating of Queen Honeybees in the Khartoum Area. Proc. 4th int. Conf. Apic. Trop. Climates, Cairo, 20-24.
27. El-Sarrag, M.S.A. and Nagi, S.K.A. (1989). Efforts to Improve Beekeeping in Sudan. Proc. 4th Int. Conf. Apic. Trop. Climates, Cairo, 158-161.
28. El-Sarrag, M.S.A.; Abdalla, M.R. and Abdalla, A.M. (1989). Behavioural Study on Native Sudanese Honeybees. Proc. 4th Int. Conf. Apic. Trop. Climates, Cairo: 401-403.
29. Musa, F.H.A.; Abdalla, M.R. and E-Sarrag, M.S.A. (1989). Studies on Feeding Colonies of Honeybees in Sudan. Proc. 4th Int. Conf. Apic. Trop Climates, Cairo: 27-28.
30. Ahmed, H.M.H; Siddig, M.A. and El-Sarrag, M.S.A. (1989). Honeybee Pollination of Some Cultivated Crops. Proc. 4th Int. Conf. Apic. Trop. Climates, Cairo: 100-108.
31. El-Sarrag, M.S.A.; El-Bashir, S. and Nagi, S.K.A. (2005). Studies on brood rearing, pollen and honey production on Sudanese and Carnica honeybees. Proc. 4th Int. Conf. Arab Beekeepers, Damascus, Syria (24-27 Nov. 2005).
32. _____ (2005). Defensive behaviour of Sudanese and Carnica honeybees. Proc. 4th Int. Conf. Arab Beekeepers, Damuscus, Syria (24-27 Nov., 2005).
33. El-Sarrag, M.S.A. and El-Niweiri, M.A.A. (2005). Honeybee Pests and Diseases in Sudan. Proc. 4th int. Conf. Arab Beekeepers, Damascus, Syria (24-27 nov., 2005).
34. El-Sarrag, M.S.A. and Al-Hag, M.S. (2009). Extraction of the honeybee venom. Proc. 6th Int. Conf. Arab Beekeepers, Abha, Saudi Arabia (17-19 March, 2009).
35. El-Sarrag, M.S.A. (2009). Effect of Propolis Past as Dressing Material on Diabetic Ulcers. 1st Conf. Promotion of invention and Industrial Innovation, Khartoum, Sudan (23-25 March, 2009).
(C) Scientific References (Books)
36. El-Sarrag, M.S.A. (1988). National Study on Beekeeping promotion in Arab Countries. Arab organization for Agricultural Development, Khartoum, Sudan. Journal/Cannon 2, 1988. (196 Pages).
37. El-Sarrag, M.S.A. (19940. beekeeping in Yemen. Original research work for 3 years in P.D.R.Y. (144 Pages).

38. El-Sarrag, M.S.A. (2010). Beekeeping in Sudan. Original research work for 42 successive years in Sudan.

(D) Essays Published by the Arab Organization for Agricultural Development (A.O.A.D.) 'In Arabic Language"
El-Sarrag, M.S.A. Expert of Apiculture, A.O.A.D.
39. The role of the bee honey in the economy of the People Democratic Republic of Yemen. (August 1985).
40. Apiary constructions (September, 1985).
41. Honeybee poisoning by pesticides (October, 1985).
42. Bee Hives (March, (1986).
43. Chemistry of the honeybee language (April, 1986).
44. Factors affecting honeybee breeding (October, 1986).
45. Apiary management (October, 1986).
46. Temperament of the honeybee colonies (November, 1986).
47. Rearing of queen honeybees (December, 1986).
48. Historical background of honey (March, 1987).
49. Honey, Chemical composition (October, 1987).
50. Honey as a major component in the National Foreign Trade of Yemen (November, 1987).
51. Honey standards in P.D.Y. (1987).
52. Varoasis in the honeybee colonies in Saudi Arabia. Risalat Al-Jamaah 14th year, No. 386, Saturday 24.12.1988.
53. The honeybee colony, Al-Sonbula, Vol. 6, pp. 40-42, 1.12.1409H.
(E) Post-graduate Supervision
(a) Major Supervisor
Degree area of specialization completion date
54. M.Sc. Biometrical Studies on Western and Central Sudan Honeybees 1981.
55. M.Sc. biometrical Studies on Southern Sudan Honeybees, 1981.
56. M.Sc. Factors Affecting Queen Rearing, 1983.
57. M.Sc. Biological and Behavioural Sudies on the Sudanese Honeybees, 1984.
58. M.Sc. life Table Data Analysis of Galleria mellonella, Major Pest of Honeybees, 1985.
59. M.Sc. The Role of the Honeybee Colonies in Pollinating Major Crops of Sudan, 1985.
60. M.Sc. Artificial Feeding of Honeybee Colonies Under Shambat Conditions, 1986.
61. M.Sc. A Comparative Study of Beekeeping in Three Different Locations in

Sudan, 1987.
62. Ph.D. Studies on Sudanese and Carniolan Honeybees, 1988.
63. M.Sc. Morphometrical and Biological Studies on the Saudi Honeybee Race A. mellifera, the Carniolan Race A. mellifera carnica poll. And their F1 Hybrid, 1995.
64. M.Sc. Chemo-Physical Properties and Pharmacological Studies on the Honeybee Venom, 2003.
65. M.Sc. Chemo-Physical Properties and Pharmacological Studies on the Sudanese Propolis, 2003.
66. M.Sc. Survey of the Pest and Diseases of Honeybees in Sudan, 2004.
67. M.Sc. Factors Affecting Extraction and Storage of the Sudanese Honey, 2005.
68. M.Sc. Effect of propolis extracts on khapra beetle Trogoderma granarium, 2007.
69. M.Sc. The effect of water extract of neem leaves Azadirachta indica and kaphoor leaves Encalyptus camaldulensis on the last instar of the greater wax moth Galleria mellonella, 2007.
70. M.Sc. Effect of honeybees products on four strains of bacteria, 2009.
71. Ph.D. Chemical analysis and effect of Sudanese propolis on bacteria isolated from diabetic wounds, 2010.
72. Ph.D. Chemical characteristics of honeybee products and their effect on diabetic patietic patients, 2010.
73, Ph.D. Studies on Insect pollination of Some Cultivated crops with Special Reference to Honeybees A. floria and A. mellifera under Eddueim conditions (in Progress).
74. M.Sc. Effect propolis extracts on wheat seed germination infested by 3rd larval instar of Trogoderma granarium. (in Progress)
(b) Co-Supervisor
75. M.Sc. Life table Data Analysis of aphids craccivora Koch (Aphididae, Homoptera) and two of its Natural Enemies, 1978.
76. M.Sc. Position of the Entitle in the Quarn, 1979.
77. M.Sc. Biological Studies on the Weevil Neochetina eichorniea (Cuculionidae, Coleoptera), an Introduced Natural Enemy of Water Hyacinth, 1981.
78. M.Sc. The Biotic Natural Control Components of Callosobruchus maculates (Fab.), 1984.
79. M.Sc. Studies on Sudanese Honeys, 1985.
80. M.Sc. Pharmacological Studies on Honey 1986.

81. M.Sc. Factors Affecting Costs of production and Returns to Investment for Beekeeping in Asir Region, Saudi Arabia, 1997.
82. M.Sc. Physico-Chemical and Biological Characteristics of Bee Honey in Saudi Arabia and Effect of Heating on Some of these Characteristics, 1997.
83. M.Sc. Factors Affecting Costs of Production and Returns to Investment for Beekeeping Industry in Khartoum State, Sudan, 1999.
84. Ph.D. Some Constraints that Hinder the Future Beekeeping Industry in the Sudan, 2004.
85. Ph.D. Taxonomical Studies on the Sudanese Honeybees Apis mellifera, 2007.

Patent Document Granted

86. Patent No. 613 dated 7th August, 2000.
87. Patent No. 618 dated 16th August, 2000.
88. Patent No. 619 dated 16th August, 2000.
89. Patent No. 673 dated 7th July, 2001.
90. Patent No. 1624 dated 25th March, 2009.

(F) Miscellaneous Activities

91. Letter of Recommendation from the Arab Organization for the Agricultural Development (AOAD), (1985/1988).
92. I have been selected to assess research project presented to king Abdul Aziz City for Science and Technology (1414).
93. More than 120 requests asking reprints from our published paper particularly Articles No. 6, 10, 11, 13, 14, 17 and 18.
94. El-Sarrag, M.S.A. (1997). Granulation of honey Extension Article No. (46), College of Agriculture, King Saud University.
95. El-Sarrag, M.S.A. (1997). Essay on Apicultural Industry in Saudi Arabia Resalat Algama'a.
96. Al-Garni, A.S. and El-Sarrag, M.S.A. (1999). Morphometrical Studies on Carnica, Indigenous races of honeybees and F1 hybrid (Accepted for publication J. King Saud University after some corrections).
97. El-Sarrag, M.S.A. (1999). Beekeeping in Sudan. Project Proposal adopted by the University of Khartoum for investment.
98. El-Sarrag, M.S.A. (1999). Historical Background of Beekeeping Industry in Arabian Peninsula (Requested by International Bee Research Association, Cardiff, U.K. – Dr. Eva Crane) (Personal Communication).

ANNEX I

List of Essays in the Field of Apiculture

1. Economic importance of the honeybee in the Sudan.
2. Standard races of the honeybee.
3. African races of honeybees.
4. Sudanese races of the honeybee.
5. Biology of the honeybee colony.
6. Language of the honeybee colony.
7. Genetics of the honeybee.
8. Swarming migration and Superseding of honeybee colony.
9. Division of labour and foraging behaviour of the honeybee colony.
10. Construction of a beekeeping industry including apiary manipulation and management.
11. Honey: Production and Chemo-Physical Properties.
12. Honey: Economy foreign trade etc.
13. Pollen collection “Chemo-Physical Properties and Uses”.
14. Propolis: Chemo-Physical Properties and Uses.
15. Wax: Chemo-Physical properties and Uses.
16. Royal jelly: chemo-Physical properties and Uses.
17. Venom: Chemo-Physical Properties and Uses.
18. Honeybee pest predators and diseases.
19. Constraints that hindered beekeeping industry in Sudan and the appropriate recommendations.
20. Honeybee poisoning.
21. Queen rearing.