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Economic Evaluation of (*Aips mellifera carnica)* Carniolan Bee Breeding as Mobile Beekeeping in Khartoum State-Sudan

التقييم الاقتصادي لتربيه النحل الكرنيولي للنحاله المتنقله بولايه الخرطوم - السودان

By

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{وَأَوْحى رَبُّكَ إِلَى النَّحْلِ أَنِ اتَّخِذِي مِنَ الْجِبالِ بُيُوتًا وَمِنَ الشَّجَرِ وَمِمَّا يَعْرِشُونَ (68) ثُمَّ كُلِي مِنْ كُلِّ الثَّمَراتِ فَاسْلُكِي سُبُلَ رَبِّكِ ذُلُلًا يَخْرُجُ مِنْ بُطُونِها شَرابٌ مُخْتَلِفٌ أَلْوانُهُ فِيهِ شِفاء لِلنَّاسِ إِنَّ فِي ذلِكَ لَآيَةً لِقَوْمٍ يَتَفَكَّرُونَ (69)}

صدق الله العظيم

(الايه 68-69 من سوره النحل)

Dedication

To the spirit of my father, my beloved mother and my brothers and sisters, to anyone who has helped me in completing this research and to all who work in beekeeping

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Abstract

This study was conducted in Khartoum State in the period of 2016 to 2019. The study aims to evaluate economic impact of Carniola beekeeping by mobile beekeeping in Khartoum state and to evaluate economic of mobile beekeepers, also to analyze samples of honey products to know if it is complying with international specificsand standards. The importance of this study is to get the benefits of the production and breeding of bees in Khartoum state in different flowering seasons for the forest and irrigated sector and to encourage investment within the State. A questionnaire was conducted, contained multiple axes and distributed to all breeders in Khartoum state with 16 breeders as a tool for collecting primary sources. SPSS analysis done to find correlation and variation between brood , beehives strength, number frames .Experiment has shown that there was a significant correlation between pollen grains collection , brood , increasing of the frames number , beehives strength. The experiment has shown that there was no significant between production of honey and the number of frames and beehives strength for the three seasons. For example, the average of pollen collection for acacia season was 22.96 □ ± 1.14 and the average of pollen for cantaloupe was 43.76 b ± 3.25. The average pollen for flower was 35.79□± 2.54. Also the questionnaire found that traditional training for the beekeepers was 48% comparing with other sectors. For successful management skill for technicians working in the dissolved must be acquired 100%. Workers' need for technical training to work in apiary was 93.7%. Bee products are marketed locally by 68.7%. Bee products can enter the national economy by 100% percentage, but there are difficulties facing the entry of the product in the economic circle, the most important one is the marketing methods which constitute 44.8%.

.The study concluded that the private sector exceeded the governmental sector by 56.2% in the establishment of bees, and the results of the questionnaire that the sources of honey bees were 56.3% purchase of local bees.

Honey samples were analyzed by the homographic device to analyze sugars, water and photosynthesis. Experiment, questionnaire and analysis of samples showed that bees and their products have an economic return, whether through pollination of crops by bees and production of bee which is a strong competitor to other products and comply with international standards but are facing difficulties such as pest and traditional marketing methods.The most important recommendations are that to invest more funds and encourage our farmers in general for beekeeping. The technology of honey production and processing is one of the most important problems of traditional beekeeping products; therefore, this sector must receive the attention of the country. Consolidation of the weaker dependencies of strong colonies can be recommended for high rates of stored pollen grains and brood production.

المستخلص

اجريت هذه الدراسة بولايه الخرطوم السودان في الفتره من 2016 الي 2019م. تهدف الدراسة لمعرفة التقييم الاقتصادي لتربية النحل الكرنيولي بالنحالة المتنقلة بولاية الخرطوم وللتقييم الاقتصادي ولمربي النحل المتنقلين وتحليل عنيات العسل المنتج ومطابقتها بالمواصفات والمقاييس العالمية. ومشكلة البحث ان ولاية الخرطوم غنيه بالغطاء النباتي الا ان منتجات النحل لاترقي بالمستوي الاستثماري المطلوب وتاتي اهمية البحث فى الاستفادة من انتاج وتربية النحل فى ولاية الخرطوم لمواسم الازهارالمختلفة بالولاية للقطاع الغابي والمروي وتشجيعا لاستثمارداخل الولاية.اجريت تجربة واستبانة واحتوت الاستبانة علي محاور متعددة وزعت الاستمارات علي كل المربين بولاية الخرطوم بعدد 16 مربي (نحل كرنيولي) كأداة لجمع المصادر الاولية وتم التحليل لعلاقة الارتباط والتباين برنامج بين حبوب اللقاح والحضنات وقوة الخلية وعدد الاطارات كلا علي حدا وتحليل البيانات للاستبيان عن طريق التحليل الوصفي باستخدام تطبيق الحزم الاحصائية للعلوم الاجتماعية (SPSS). واوضحت التجربةان هناك علاقة معنوية عالية بين جمع حبوب اللقاح والحضنة المرباة وزيادة عدد الاطارات وقوة الخلية , وأيضا اوضحت التجربة انه لا توجد علاقة معنوية بين انتاج العسل وعدد الاطارات وقوة الخلية للمواسم الثلاثة. متوسط جمع حبوب اللقاح لموسم السنط $22.96^{a} \pm 1.14$ بالبوصة المربعة ومتوسط حبوب القاح للشمام $43.76^{b} \pm 3.25$ بالبوصة المربعة ومتوسط حبوب اللقاح لزهره الشمس كانت $35.79^{c} \pm 2.54$ بالبوصة المربعة ومن محاور الاستبيان في اطارالتدريب لمربي النحل كان التدريب من القطاعا لتقليدي 48% مقارنة بالقطاعات الاخري . ولادارة ناجحة للمنحل بنسبة 100 % لابد من اكتساب المهارة للفنين العاملين في المنحل . حيث ان حوجة العمال للتدريب الفني للعمل في المنحل بنسبه 93.7% . يتم تسويق منتجات النحل محليا بنسبة 68.7% . يمكن أن تدخل منتجات النحل في دائرة الاقتصاد القومي 100% ولكن هناك صعوبات تواجه دخول المنتج في دائرة الاقتصاد اهمها طرق التسويق التي تشكل 44.8%.. وخلصت الدراسة الى ان القطاع الخاص تفوق علي القطاع الحكومي بنسبة 56.2% في انشاء المناحل ,ومن نتائج الاستبانة ان مصادرنحل العسل كانت 56.3% شرءا من النحل المحلي . في اطارالتدريب لمربي النحل كان التدريب من القطاع التقليدي 48% مقارنة بالقطاعات الاخري . ولادارة ناجحة للمنحل بنسبة 100 % لابد من اكتساب المهارة للفنين العاملين في المنحل . تم تحليل عينات العسل بجهاز الهموتغرافك لتحليل السكريات والماء والانحراف الضوئي .واظهرت الدراسة ان النحل ومنتجاته ذات عائد اقتصادي سواء كان عن

طريق تلقيح المحاصيل بواسطة النحل وانتاج منتجات النحل ويمكن ان تدخل منتجات النحل كمنافس قوي لمطابقتها للمواصفات والمقاييس العالميه للفاو codex ومن اهم المعوقات التي تواجه المربين الافات وطرق التسويق التلقيدية .

اهم التوصيات استثمار المزيد من الأموال وتشجيع المزارعين بشكل عام على تربية النحل ، وذلك لأن لديهم إمكانات إنتاج عاليه وخاصه مربي النحل التقليديين كما ينبغي التثقيف والارشاد حول تربية النحل الحديثة وإدارتها.

استخدام تكنولوجيا إنتاج العسل ومعالجته لذلك يجب أن يجد هذا القطاع اهتمامًا من جانب الدولة

يمكن التوصية بتوحيد التوابع الضعيفة من المستعمرات القوية للحصول على معدلات عالية من حبوب اللقاح المخزنة وإنتاج الحضنة بدرجة جيده .

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CHAPTER ONE

1.1. INTRODUCTION

Sudan is one of the largest countries, in Africa.Many natural trees and cultivated corps visited by the honey bees in the Sudan *Acaciaalbida,a.chrenoborigia , Anilotica* (Ali 2007).

The number of beekeepers in Sudan is estimated to be around 50,000. The beehive is estimated to be traditional beehive about 19700beehivesand modern beehive8780(Ministry of A. R 2014).

Honeybeesare one of the most organisms across phyla. Their usefulness to the human race can no way be overestimated. Other than contributing directly to human well-being by producing a wide variety of products, honeybees are also responsible for enhancing the agricultural production through their pollination services.Honeybees are also a model system for understanding social behavior and communication (Mohammed, and elaware; 2008);*Apis mellifera* is the source for honey, beeswax, and a variety of other health and nutritional products. Honeybee and its products such as honey, pollen, royal jelly, propolis, beeswax, bee bread and venom offer outstanding therapeutic potential for many debilitating human diseases including cancer, tuberculosis, mental illness, HIV/AIDS, Parkinson's disease, hypertension and other cardiovascular disorders (Eisa and Roth, 2008). The products are important in value as honey bees as pollinator (Delaplane2008).These tiny noble insects are also indicators of world biodiversity and environmental quality. For instance, as pollinators, honeybees help to perpetuate plant species and other genetic resources, which are vital components of biodiversity (Mohammed and Roth 2008).

Honey bees evolved about 400 million years ago .Rock paintings dating form as back as 7,000 B.C .No one Knows when people first started keeping on honey bees but it is clear that the ancient Egyptian ,

Greeks and Romans were all avid beekeepers .Beekeeping developed most between 1500- 1850 (Ali.2007).

The first revolutionary discovery involved understanding the life cycle of bee. In 1586, Luis Mendez de Torres first described the queen bees as female that laid eggs. In 1609, Charles Butler in Feminine Monarchiein denitrified the drones as male bees. In 1637, Richard Remnant in Discourse or Histore of Bees recognized that the worker bees were females .The understanding of the life cycle helped beekeepers care for their colonies .In 1825, Langstroth, patented a hive with movable frames that is still used to day. The principle up on which Langstorth based his hive is the space kept open in the hive to allow bees passage between and round combs .In 1938 Petllter give a delailed account of the development of wax –comb foundation(Abrol1997) .

Beekeeping practice started in the Sudan thousands of years ago .It earliest evidence in the country was provided by statue of King Taharka (663- 688) b.c. The greatest of Naptan kings of the Sudan in the ancient world(El-sarrag1977).The native honeybees in Sudan were first classified as*Apismelliferanubica*and reclassified to *Apismellifera yemenitica*(Rutnure 1976).Thehoneybee *Apismellifera* L. has been classified morphologically to 24 subspecies, and grouped into four branches according to their geographical distribution (Ruttner, 1988)(El-Sarrag *et al*; 1992) reported that there at least two subspecies of honeybees in Sudan: a yellow banded group *Apismellifera*Sudaneseshovsubsp and a mixed group of *Apismelliferanubica* Ruttner. The clusters of the Sudanese bees were also classified morph ometrically by (Mogga1988) and divided into three sub-clusters; the smallest bee, *Apismelliferayemenitica*, (Ruttner), The medium bee *Apimellifera*Sudanese, (Rashad) and the largest bee *Apismellifera* bandasii. Beekeeping in Sudan is still practiced in a very

primitive way. There are about 200.000 honeybee hives in Sudan with a total number of about 50.000 beekeepers. The vast majority of these are using traditional beekeeping technology and only ~1% use modern beekeeping equipment and technology (El-Sarrag *et al*; 1988).Until 1985 *A.mellifera* was only known species in Sudan. Colony of*A.florea* was observed In garden near Khartoum international airport(Ali 2007).

1.2. Problem statement:-

Khartoum Sate is endowed with prosperous and diverse natural rescores, in particular potential tree resources which can support the food security, livelihoods and economy. But bee products do not match the level of vegetation. Mobilebeekeepers play amajor a role in providing nutritional, economic and ecological security by adding bee colonies to increase pollination.

1.2.1 Hypothesesof the study

1-Breeding of beekeepers in Khartoum State contribute to increase national income and the introduction of foreigncurrency.

1- The honey beequeens production are treat easy with high productivity to increase the number of the packages honey bees and thus increase productivity
2- Increase economically productivity in pollination of horticultural and agricultural crops by bees and increase bee products.

1.3. Objective:

1- To evaluate the Carniolan bee as mobile beekeeping for cross - pollinator in different crops in different season social and economic.

Sub Objectives:

- Economic and Social Assessment asmobile Beekeepers in Khartoum State.
- To analysis a sample form ofSudanese honey and compare with world standard.

1.4. ResearchMethodology:-

Area of study : Khartoum state .

Sample size: 11 bee hive carniola honey bees ,

Data collection: 2016 - 2017

Correlationresultsanalysis by (SPSS):-

Pollen grains (y1) X1(open brood), X2(sold brood), X3(Strength frame), and(Number farm) X4

Honey(y2) (Strength frame) X3, and(Number farm) X4

Y1αX1,X2,X3,X4.

Y2α X3,X4.

Questionnaire: - Descriptive analysis was done for analyzing the raw data of the study by using approach and the use of the closed questionnaireStatistical Analysis (SPSS).

Secondary Sources: - Books - References - Reports - Papers for seminars and workshops - Lectures - Practical magazines - The spider network.

Research Range: - state of Khartoum.

Research Time: - 2016-2019

CHAPTER TWO

LTTERATURE REVIEW

2-1Honey- bee

Honeybee species are characterized by particular functional traits that facilitate pollination services to a greater or lesser degree(Bluthgen and Klein 2011).

2-1-1Classification and Diversity

Honeybees are insects that come under order Hymenoptera and family A*pidae* Based on morphometric, behavioral and biogeographical studies, 26 subspecies have been identified (Bluthgen and Klein 2011).

Honeybees comprise the genus *Apis* in the family A*pidae*, order Hymenoptera. The European honeybee is classified as *A.mellifera*, the Indian honeybee is *A.cerana*, the Koschevnikov's honeybee is *A. koschevnikovi*, the dwarf honeybee is *A.florea*, the dwarf honeybee is *A. andreniformis*, the giant honeybee is *A. dorsata*a and the giant mountain honeybee is *A. laboriosa*. Three of these are native to Asia and one is native to the Euro-African region. All of these are similar in appearance, though there are differences in size and colour. All build vertical combs that are two cells thick. All bees feed on pollen and nectar and make nests with wax secreted from their bodies.(Sunita; *eatl* ;2017)

2-1-2Distribution

Worldwide, there are perhaps 20,000 species of bees, of which 500 are social bees mostly in the family *Apidae*. In sub-saharan Africa, there are over 3,000 species of bees, (Mary 2007) many being endemic. Most important among the African *Apidae* are the stinging (*Apis*) and stingless honey bees (Trigona) (Martin*et al*; 2001). Within the genus *Apis*, *A. mellifera* is the most useful species, and is therefore known best by scientific studies on several aspects (El Shafie, *etal*; 2002). The honey

bee, *Apismellifera* L., occurs naturally in Europe, the Middle East and Africa, which is the largest area whereoriginal lived. This diverse range of habitats has required adaptation to a variety of ecological and climatic conditions and historical separation has caused the evolution of over 24 named subspecies. On the basis of morphology, these subspecies have been grouped into four distinct evolutionary branches, namely the African, the western and northern European, the southeastern European, as well as the Middle Eastern. Molecular analyses have broadly supported this class ification. Some of the most commonly referred African races of honeybees (*Apismellifera*) which have been identified, including aspects of their behavior are *Apismellifera* intermissa, *Apismellifera* lamarckii (Egyptian bees found in North East Africa primarily in Egypt and the Sudan along the Nile Valley), *Apismellifera* scutellata, Apis mellifera adansonii, *Apismellifera* monticola and *Apismellifera* capensis (Accessed, 2008). The borderlines between the different races are not well known (The Danish Beekeepers, 20008). The distribution of honey bees in Sudan depends on environmental conditions. Northern Sudan is desert, and indigenous honeybees do not exist north of Khartoum. In South, rainfall increases, and so does vegetation through savannah until finally the lush rain-forest near Sudan southern boundaries. Along the two Niles in Sudan honeybees (*Apismellifera*) occur rarely north of Ed Dueim and Wad Medani. At Kosti, they are compelled to utilize densely foliaged mango trees and build combs on horizontal branches. The little bee (*Apisflorea*) of the Middle East was first recorded in Sudan in 1987 in Khartoum, where it utilizes thick shady trees and shrubs for building its small single multiuse comb. Although placid, it is not very adaptable to apicultural practices. The honey is not easy to harvest without detaching the entire comb and thereby destroying the swarm, so it is of limited commercial significance. The native Khartoum bee was more aggressive than the

Carniolan race, Blue Nile bees and hybrid colonies. Migration, swarming and supersedure of the native honeybees was quite noticeable (T I O B, 2008) (Mary 2007), (Martin*et al*; 2001)(mohammed and Roth2008) .

2-1-3Type of Honey beein Sudan:

Wild honeybees of the species *Apismellifera* are widely spreading in Sudan since ancient times, establishing their nests on trees and fallen logs in various forests or on rocks roofs and crevices of some mountains (Williams, 1987). For domesticated honeybees, beekeepers mainly utilize different kinds of traditional hives (El-Sarrag,1977), whereas in recent years modern beekeeping is flourished using Langstroth hives (El-Niweiri*et al* , 2005). The highest populations of wild honeybees (*A.mellifera*) were found in the Southern parts of the country including, Blue Nile, Southern Kordofan and Southern Darfur States. However, the populations decrease gradually as we go northward. Therefore, it is claimed that there were no honeybees in the Northern State of the Sudan (Rashad and El-Sarrag, 1980).

Nevertheless, the wild Sudanese A. *mellifera* was detected in very limited parts and the highly in evasive small bee *A. florea* is hardly invading the north. Indeed, the harsh desert climate in the north might have negative impacts on the occurrence of honeybees in that region (El-Niweiri, Moritz RFA, 2013). However, different subspecies were reported in similar climatic regions including: *A. m. sahariensis* in Maghrebin, *A. m. lamarckii* from north east Africa (Egypt), and A. m. jemenitica from Arabian Peninsula (Ruttner,1988; Hepburn, 1998).

The honeybees from Sudan morphmetrically belongs to *A. m. jemenitica* in Mashriq (Ruttner, 1988) and genetically has consequences for the interpretation of the biogeography of *A. mellifera* in the Maghreb and Mashriq regions (El-Niweiri. *et al*, 2008). Moreover, the drawings of bees

detected inside temples and pyramids of ancient Nubian civilization in the north, clearly demonstrated that the people in this area were well acquainted with bees at that time. Hence, the question is that why honeybees are rarely found in this part of the country, although their occurrences in neighboring areas particularly the south part of Egypt were documented (Hepburn, 1998). In an attempt to find some answers, recent surveys were carried out covering all parts of the northern Sudan (River Nile and Northern States) to monitor the population abundance of both *Apismellifera* and *A. florae* along the whole area. The investigation emphasizes argel plant, Solenostemma argel, which detected during the surveys as a bee killer, and thought to be among the main reasons hampering spreading of bees in the north. Moreover, the study also included brief account on important environmental factors affecting the occurrence and population buildup of honeybees in such area.

Due to aggressiveness of Sudanese honeybees, Carnio-Egyptian bees are imported and used for honey production in most modern apiaries. Regrettably, this approach has contributed to introduction of several pests and diseases of honeybees to the country (El-Niweiri*et al*, 2005) El-Niweiri*et al* 2009).

On the other hand, the invasive dwarf honeybee, *Apisflorea*, was introduced accidentally to Khartoum in1985 (Lord and Nagi , 1987)(Mogga ,1988), thenceforth it became established and continuously invading other States. The last northern limit for *A. florea* was recorded to be at Abu-Hammed area (El-Niweiri*et al*, 2004). In several reports it became clear that *A.florae* was expanding from Southeast Asia towards the west. The occurrences of *A.florae* in the warmer parts of Oman Iran and Pakistan were well documented (Ruttner, 1988) (Hepburn,2005).

It is now found in the Middle East including Iraq and has established sustainable populations in the Arabian Peninsula and central

Saudi Arabia (Alghamdi*et al* 2000)(Hepburn,2005). Most recently *A.florea* has been reported in Eilat and Aqaba (Haddad and Moritz ,2010).

2-1-4Beekeeping Practices:

The tradition of beekeeping in Africa dates back almost 5000 years when beehives were first used for producing honey in ancient Egypt. During the course of time it has spread from Egypt to the Middle East, throughout the Mediterranean and south into tropical Africa (Roth and Eisa, 2008). In tropical Africa, beekeeping practices vary only slightly across the continent, based on good knowledge of botany and ecology, that makes beekeeping possible under very complex circumstances. In the region as a whole, local honeybee races exploit scattered resources by moving from area to area. This means that some hives remain empty for parts of the 3-4years especially under adverse weather conditions. African races of honeybees also have a high rate of swarm production (Hussein, 2000). A beehive is any container provided for honey bees to nest in. The idea is to encourage the bees to build their nest in such a way that it is easy for the beekeeper to manage and exploit them (Accessed, 2008).Emin pasha gives an early description of the use of bark hives when coming across them among the Dinka of east Sudan in 1888. Traditional hives are made from whatever materials available locally: e.g. logs, bark, clay, grass, or cane. Traditional beekeeping includes clay pots, cylindrical log hives, bark hives , grasses woven into mats and rolled up, leaves of the doum palm "tangels". In Sudan a beehive was designed for usage by natives of the Southern parts of the country, by developing the so called Khartoum and Omdurman hives (T I O. B, 2008). Modern low-technology hives like Kenya tops bar hives, Omdurman clay hives, Gufa basket hives and modern hives are used in Sudan (Hussein, 2000), while in Uganda beehives are traditionally

constructed from timber, bambooboruss palms or woven from forest climbers (B U, 2008.). Moreover, in Zambia beehives are made by stripping bark off a living tree. The cylindrical hives are about 120 cm long and about 30 cm in diameter. The joint along the length of the hive is secured with seasoned hardwood pegs. The ends are then closed either by circular plaited grass doors made of fine thatching grass, or by another piece of bark. The hives are then left to dry for two months before being hung in trees (Njovu, 1993)

2-2Members community of the bee: The community of bees consists of one queen, thousand female workers and a few of male

2-2-1Queen

Within a hive, there is only one queen. It is a female bee with a fully developed reproductive system. The queen mates only once with several drones, and then remains fertile for life. A queen can live for 3-5 years and can lay up to 2,000 eggs per day. Fertilized eggs become female (workers) and unfertilized eggs become male (drones). When the queen dies or becomes unproductive, the other bees will initiate the development of a new queen. For queen bees, it takes 16 days from egg to emergence (BYBA 2011).

2-2-2. *Worker*

A worker is a female bee of which the reproductive organs are undeveloped, due to a specific diet during its development stage and through the activity of queen pheromone in the colony. The vast majority of honey bees are worker bees. Worker bees may live for 4-9 weeks during the winter season, but only 6 weeks during the demanding summer months. For worker bees, it takes 21 days from egg to emergence (BYBA 2011).

The worker bees sequentially take on a series of specific tasks during their lifetime, as depicted in .The activities of young bees start in

the Centre of the brood nest with the cleaning of cells and tending the brood. Subsequently, the workers go to the outer edges of the nest in order to pack pollen and store nectar. Until after about three weeks, workers become foragers for another 10-20 days. Foragers take care of bringing from the environment everything that the colony needs in the hive: pollen, nectar, water and propolis some activities can be executed lifelong.

2-2-3. Drone

Drones are fertile male bees that are kept on standby during the summer for mating with a virgin queen. Because a drone has a barbed sex organ, which cannot be pulled out of the female genital opening, mating is followed by death of the drone. For drones, it takes 24 days from egg to emergence (BYBA 2011). Because drones are of no use in the winter, they are expelled from the hive in the autumn.

2-3Honey bee cycle

As with most advanced insects, honey bees exhibit a complete development or metamorphosis during their life: the young and the adults look very different. The life stages of a honey bee are egg, larva, pupa and adult. Note that the cells are depicted vertically, but in reality, they are oriented horizontally. The first three stages are also referred to as brood. Development from egg to adult in general takes two to three weeks (Stone 2005).

2-3-1 *Egg*

The eggs are described as having an appearance similar to sausage-shaped poppy seeds. Each egg has a small opening at the broad end of the egg, the micro Pyle, which allows for passage of sperm. Hatching takes place three days after egg lying.

2-3-2Larva

From hatching of the egg, the larval stage lasts six days. Upon

hatching, the larva is almost microscopic, resembling a small, white, curved, segmented worm lacking legs and eyes. It lies coiled on the bottom of the cell. Larvae are fed royal jelly and later bee bread, i.e. nutritional granules of pollen with added honey or nectar prepared by the workers.

Each larva receives an estimated 10,000 feedings during this stage. Larval weight increases 5.5 times during the first day and approx. 1,500 times in 6 days.

The process of feeding and growing takes place while the cells are uncapped; the larvae spin their cocoons and change into pupae after workers have capped their cells (Winston 1987). Larval stage durations vary: 5.5 days for queens, 6 days for workers, and 6.5 days for drones. Regardless of whether the larva is male or female, it moults five times during its larval stage (Stone 2005).

2-3-3Pupa

The pupal stage is a stage of massive reorganization of tissues: the adult tissues develop from the imaginal discscarried by the larva. Organs also undergo a complete transformation; while the body changes from the worm like larval body shape to the adult body shape with three distinct body regions .The pupal stage lasts about 8-9days for workers and drones, and 4-5 days for queens.

2-4Bee Products

2-4-1Honey:

Honeybees is the most important products of beekeeping; it can be used as food, as a food ingredient, as an ingredient in medicine-like products and in many fermented honey products (Louveaux,*el;tl*) It is also considered as one of the non-wood products of tropical forests which have significant livelihood value, leading to the consideration of non-wood products as astrategy for the sustainable use and conservation of

forests [kusters,*el.tl*;2006) (peters,el.tl1989) (shackleton,*el,tl*; 2008) Sustainable beekeeping can only be achieved through understanding and conservation of the most resourceful plants for the bees in terms of nectar, pollen and resin. Although there were some attempts to document the bee plant in some African countries**(**Crane,*el.tl* 1984.) **(**Hepburn,and Radloff.1997). (Hepburn ,*et.al*;1995).

Much more information is needed in this field. Indeed some Paly nological analysis of honey products was conducted in Sudan; the botanical origin of Sudanese propolis was identified as *Acacia* spp, Mimosa spp (Elsayed, 2001). Likewise pollen grains of forest trees were identified in Sudanese honey by different authors (Ibrahim. 1985). (Nagi, 2008).,(Nagi, 2006). (Seif Eldin,*et.al* 2010). Honey produced by traditional beekeeping is still common in many African countries including Sudan (Hussein, 2000)]. Hence all forest ecosystems, which contain indigenous species and races of bees, would be the most suitable area of traditional beekeeping. Moreover forest is promising for modern beekeeping. In America forest areas has been suggested for apiculture, especially for small privately owned plots (Hill and Webster 1995). In addition to traditional beekeeping, migratory beekeeping in the forest might be of great importance for honey production in Sudan. However, Loss of plant has negative implications for beekeeping and honey production. Populations of honeybees and other pollinating insects have been decreasing worldwide in recent years, limiting their production of food crops and wild plants (Wardell, *et.al* 1998).A major reason for these population declines is the loss and fragmentation of natural and agricultural foraging habitats for bees, along with their flora (Goulson, 2003). (Kremen, *et,al*; 2002).. For example habitat loss in Africa regarded to be the most significant factor affecting honeybee populations. In addition to the collection of pollen, nectar, propolis and honeydew,

honeybees mostly nest in hollow trees and deforestation could affect them drastically. Between 2000 and 2005, about four million hectares of forest were destroyed annually (Kelatwang and Garzuglia 2006). Similarly the forest cover in Sudan declined from about 76.4 million hectares in 1990 to about 69.95 million hectares by the end of 2009 (FRA, (2010) which means that the forest cover has decreased from about 32% to 29% of the total area of the country. In Darfur alone, annual deforestation rates stand at 1.2 per cent (Crafter, *et.al* 1997) Moreover 68% of Sudan forest that's located in Southern Sudan(FRA,2010))has gone to the new country emerged. On the other hand, large scale farmers in Africa are equally impacting the honeybee floral resources negatively. This is due to clearance of large tracts of natural vegetation as well as the use of chemicals such as pesticides and herbicides (Atkins *et.al* 1978)(B.Cynthia, *et.al* 2005),(Halsall and Gray 1998),(Mayer.*et.al*,1998). (Mohammed1995). **(**Reedm *et.al* 2013).**(**Schmuck and Keppler 2003**) (**Schmuck *et.al* 2001).

Honey Composition Honey is a source of carbohydrates — mainly fructose (about 38.5 percent) and glucose (about 31.0 percent). The remaining carbohydrates include maltose, sucrose and other complex carbohydrates. On average, honey is 17.1 percent water. In addition, honey contains a wide array of vitamins, such as vitaminB6, thiamin, niacin, riboflavin and pantothenic acid. Essential minerals including calcium, copper, iron, magnesium, manganese, phosphorus, potassium, sodium and zinc as well as several different amino acids have been identified in honey. (Some of these compounds exist in quantities (Paetzke 2010)

2-4-2 **Pollen grains**:

Are major source of protein, fats, vitamins and minerals, It is essential for the growth of larvae and young adult bees. Collecting pollen depend on many factors such as race of honey bee, honey bee health, environmental conditions and planting area around the apiaries (Hassan, 2007).Honey bee *Apismellifera* L. colony need pollen and nectar to fuel foraging flights, generate heat to thermo-regulate the nest and to rear brood. Nectar is a carbohydrate source, while pollen grains are the male germs of flowers, rich in high quality protein, which serve as the building material for growth and tissue repair to honey bee colonies (Somerville, 2000)(AlGhamdi, 2002)(Mishima *et al*., 2005). The demand for pollen increases during times of heavy wax production and honey flow (Somerville, 2000).

Bee worker's start to consume pollen just a few hours after emerging and this amount reaches maximum when they are four to nine days old (Crailshem *et al*., 1992). Pollen supplies the bees with the protein ,lipids ,vitamins and minerals needed to rear larvae (De Groot, 1953)(Manning, 2001). The quantity of pollen affects the number of eggs that laid by the queen and proportion that are reared to adults (Allen *et.al*, 1986). Honey bee collect a large quantity of pollen from different crop over the year, but pollen gathering activity depend on some factors such as race of honeybee, honey bee health, environmental conditions and planting area around the honey bee colonies, ... etc. The honey bee workers collect different types of pollen irrespective of their protein content but it may be depend on other factors such as volatile component, colony status and color. The plant source of pollen can often identified from the color of the pollen loads and almost 0.01% of all pollen loads are color mixed [Stanley and Linskens, 1974; C.F.(Hassan *et al*., 2015)]. The amount of pollen and brood in the colony reflects its status and can

be used to expect the honey yield produced at the end of the season. Several investigators have proved positive correlation between stored pollen, brood production and honey yield, (Shoreirt *et al.,* 2002) (Jevtic *et al.* , 2009) . The collection of pollen by bee workers was influenced by numerous factors including both internal and external ones. Internal factors like the higher are under brood in the colony, which stimulate the bee workers to collect more pollen. The external factors are temperature, light, wind and rain (Kaur and Kumar,2013)

2-4-3Royal jelly:

Is one of the most valued products of honeybee colonies, and produced from hypo pharyngeal and mandibular glands of 6-12 days old workers, which called nurse bees (Deseyn,*et.al*;2006). Royal jelly is a white creamy substance consists mainly of proteins, sugars, and lipids (Schmidt 1997). Honeybee workers don't stock royal jelly, being immediately utilized in larval feeding.

The royal jelly has several uses such as feeding worker and drone honeybee larvae and feeding honeybee queen during all its larval phase and adult life (Wang and Moeller, 1969). Humans have used royal jelly for a long time for its benefits as it's believed that it stimulate the immune system, strengthens the body and it's a good assistant cure for many diseases such as leukemia, cancer, high blood pressure, high cholesterol, and infertility in males and females (Krell, 1996) (Sahinler, 2000). Royal jelly is being produced as a result of grafting process and the acceptance of grafted queen cups is being affected by type of nutrition and queen cups introduced to the bees (Mohanny, 1999) (Zeedan, 2002). Moreover, acceptance percentage of queen cell was significantly higher when the grafted larvae were less than 48 hrs old (Abd Al-Fattah *et al*., 2003). Furthermore, (Ibrahim2002) showed that the total quantity of royal jelly

produced by the colony was higher in queen less colonies than in queen right ones.

Not only that , but royal jelly production is also being affected by bee race as (Saleh 1999) showed that, the Carniolian bees was the best tested one for collected royal jelly, followed by the Italian bees.

2-4-4Bee venom

That is dried on a glass plate and then scraped off looks like a cream to grey-coloured gummy powder. The quality of the bee venom is determined among other things by its mellitin content. Good quality dried venom contains 40 to 60% of this compound. (M. Mutsaerselt)The collection of bee venom was scheduled as follow Electric shock method devise was used for bee venom collection fixed on the entrance of the colony below the experiments production as it was suggested by Benton, *etal*1963),(Nobre, 1990),(Khattab, 1997) and(El Ashhab2002)

2-4-5Bee Wax

Bees need wax as construction material for their combs. They produce it in their wax glands, which are fully developed in 12 to 18 days old workers. In older bees the wax glands diminish their activity. However in emergency situations wax-synthesis can be reactivated. Greatest quantities of wax are produced during the growth phase of bee colonies, under moderate climate conditions during April to June. A bibliography on the synthesis of beeswax is given in the monograph of Hepburn . The main raw materials for wax formation are carbohydrates, i.e. the honey sugars fructose, glucose and sucrose 55. The ratio of sugar to wax can vary from 3 to 30:1, a ratio of around 20:1 being typical for central Europe 55. The stronger the colony.The smaller the ratio, the more economical the wax production for the colony. One Langstroth frame, containing only 100 g of wax can hold 2-4 kg of honey. Wax

production and comb construction activity in the bee colony are determined by following factors:

Nectar flow: the greater the flow, the more combs are needed for storage.

Brood rearing (egg laying): the more eggs are layed, the more comb cells are needed .The presence of a queen: only colonies with a queen build combs.

Temperature: temperatures higher than 15° C favour comb building activity.

The presence of pollen as a protein sources (Bogdanov 2016,).

2-4-6USES OF BEESWAX

Beeswax has hundreds of uses, of which the following are but a few examples.

In cosmetics around 40 percent of the world trade in beeswax is used for the cosmetics industry, which requires first class beeswax that has not been overheated, is pure and free from propolis. The world price i usually around US$4-10 per kilogram. At a local level, making skin ointment from beeswax can be one of the most profitable beekeeping activities.sn pharmaceutical preparations a round 30 percent of world trade in beeswax is used by the pharmaceutical industry that, like the cosmetic industry, requires good quality wax.

2-5 Importance of Beekeeping

Beekeeping is an important component of agriculture and rural development program in many countries. Beekeeping plays a role in providing nutritional, economic and ecological security.

The economic importance of bee breeding, measured in dollars, is probably greater than is realized even by the beekeeper. The potential stake of agriculture in the United States in queens alone is over $2,000,000, if a value of 50 cents, the minimum price set by the

marketing agreement governing the sale of queens .queens in the more than 4,000,000 colonies of bees in this country. The amount invested in bees, hive and honey-house equipment, and the like is $35,000,000 to $50,000,000 on the conservative basis of $8 to $12 per colony., (Nolan2017).

The honey and beeswax annual production potential of Ethiopia is estimated at 500,000 and 50,000 tons, respectively. Currently, the country produces over 64,000 tons of honey and 6,000 tons of beeswax that accounts for more than 25% of the production in Africa.(The African Honey Magazine, 2017) . To address this situation, nowadays there is a strong .The product of honey and beeswax annual production potential of Ethiopia is estimated at 500,000 and 50,000 tons, respectively. Currently, the country produces over 64,000 tons of honey and 6,000 tons of beeswax that accounts for more than 25% of the production in Africa.(“Beekeeping Industry for Sustainable development. Honey production in Brazil grew by 97.3 % and propolis production by 232.7 % in 2001/02 (SEBRAE, 2006), due to export demand. In 2009, the state of Paraná was the second largest producer of honey, and western Paraná accounted for approximately 20 % of this production (IBGE, 2009), mainly from small producers, who generally do not exchange or select queens and do not produce propolis commercially. The genetic improvement of A. mellifera, mainly of European races, for hon-ey production has been practised for decades (Rinderer, 1986); however, little has been achieved in genetic improvement for propolis production.(M .Rondon).

2-6Honey bees needed

2-6-1Nectar

This exudate is secreted by nectaries, .glandular tissues located on various floral parts .Sugars the total solutes in floral nectar: these are mainly sucrose, fructose and gluco and Other compounds, such as amino acids, phenols, lipids and antioxidants, are found as well, but mostly in trace quantities. Nectar is collected from flowering plants by adult worker bees.

Honey bees get most of their nectar and pollen within a half-mile radius of their hive location. However, they can travel from one to two miles on their collection trips, (Leonardo Galetto and Gabrlel Bernardello 2003)

2-6-2Vegetation

Is comprised of a collection from plants communities with distinguishable characteristics that occupy an area of interest. Honey yields are largely determined by the characteristics of the vegetation and rotational flowering times of different tree species. Beekeepers are always paying attention to monitor the herbaceous plants, shrubs and trees that are especially important for bees, and will often know whether the bees are collecting nectar and/or pollen. Often beekeepers will recognize, from the colour of pollen being carried by workers arriving at the hive, which plant species the bee has been visiting .

2-6-3Sunlight

When locating the bees, sunlight. The hives should have as much sunlight as possible, especially during the winter months. Face your hive toward the south, where the entrance will have the greatest posure to

sunlight and will be protected from the cold north winds of winter. If the location makes it inconvenient to place the hives facing south, try facing them east to catch the morning sun

2-6-4Water

Bees, like all animals, need a constant supply of water. It is best if there is a stream or pond in the vicinity of the beehive. A good source of water and the bees will learn to go only to that safe "watering hole." Make certain that the water source has something in it the bees can land on without danger of drowning, such as cork floats, bark, or layers of crushed

2-7Pollination

By adding bee colonies to increase pollination, farmers and beekeepers can gain much more than just the yield of honey.

The beekeeper can hire out the hives to a farmer for the duration of one crop cycle. A beekeeper places two hives per hectare in a field of Helianthuss. Without bees the farmer yields 500 kg of Helianthus seeds per hectare, and with the bees 850 kg, thus 350 kg more. The beekeeper yields 50 kg of honey per colony, which is 100 kg per hectare. The Helianthuss yield € 1 per kilo, and the honey also about € 1per kg, after expenses are deducted.

The farmer earns, therefore, 3.5 times more from the pollination than the beekeeper earns from the honey. The farmer pays the beekeeper €25 per hive, which is a total of € 50 per hectare. The beekeeper thus earns € 150 per hectare. That is one and a half times what he earns from the honey alone. The farmer earns €(350–50) = € 300 per hectare extra. This is 60% more than the yield without bees.(M. Henk.elt 2005).

The survey and evaluation of Khartoum State area for flowering plants lasted for 18 successive *months* from February, 1999 to July, 2000. A list of 85 such plants is provided, bee plants abundance and dearth were clearly indicated in the thesis as well. The various length of flowering periods of the various plant species, flowering density per plant and bees *(Apismellifera L. and Apisflorea F.)* preference for some of them were recorded. Indigenous plant species are mostly blooming during autumn and winter seasons. Exotic plants which are utilized in the area as shade and ornamental plants, many of them bloom during summer, therefore, they compensate for the lack of flowers in the dearth period. About a dozen plant species can be referred to as good foraging plants (key plants) in the area*: Grewiatenax*, *Zizyphusspina-christi*, *Balanitesaegyptiaca*, *Acacianilotica*, *Acaciaseyal*, *Capparisdecidua*, *Tamarindusindica*, *Mangiferaindica*, *Albizialebbek*, *Plumeriaspp.*, *Eucalyptusspp*. and*Acaciamellifera*. *Guddeim* (*Grewiatenax*) planting in the area is recommended on large scale. The important factor affecting flowering in the area was the availability of water (irrigation water, high under ground water-table and rains). Khartoum State is rich in flowering plants, with more human efforts for green surroundings will have ample foraging sources for bees and hence suitable as a beekeeping place. (Khidir *et al* 2009).

2-7-1*Acacianilotica*:-

Acacianilotica is naturally widespread in the drier areas of Africa, from Senegal to Egypt and down to South Africa, and in Asia from Arab ia eastward to India, Burma and SriLanka. The largest tracts are foundin Sind. It is distributed throughout the greater part of India in forest areas, roadsides, farmlands, tank foreshores, agricultural fields, village grazing lands, wastelands, bunds, along the national highways andrailway lines Mostly it occurs as an isolated tree and rarely

found in patches to a limited extent in forests It has been widely planted on farms throughout the plains of the Indian subcontinent It is a species of Southern Tropical dry deciduous forests and Southern Tropical (Kiran and.Bargali 2006).

2-7-2*Cucumismelo* :

In the Sudan, waterCucumis melo (*CitrulluslanatusThumb*) is the most important cucurbit crop followed by sweet Cucumis melos (*Cucumismelovar*. *cantaloupensis*) snake Cucumis melo (*Cucumismelovar*. *flexuosus*). Landrace varieties of Cucumis melo used to dominate over most of the major growing areas particularly in Gezira scheme, Rahad basin, New Halfa, Kassala state and along the White Nile banks stretching between Dueium and Elgaballain. In the past two decades, high yielding top quality Cucumis melo such as Galia and Ananas quickly replaced the poor quality land races. Galia Cucumis melo is a sweet Cucumis melo hybrid known for its high quality taste and flavour. It was first introduced into Sudan during the growing season 1986-1987 by the Arab Company for Agricultural Production and Processing (ACAPP). The area under cultivation at that season was only 8.5ha. After successful seasons of growing, expansion in this new line of production was started. The produce was meant mainly for export to Arab countries and Europe. Galia Cucumis melo proved to be a good hard currency earner and as a result became a leading export vegetable from Sudan (Ministry of Planning, 1980). The area under Galia Cucumis melo cultivation is increasing year after year due to prospects for export and urbanization. This trend will result in increasing area under production in different parts of the country. Improved cultural practices and production packages including plant population per unit area are needed. to boost production for export and internal consumption

2.1 Ecology Cucumis melos (*Cucumismelo* L.) are annual crops grown in different parts of the world, where frost–free seasons with plenty of sunshine and heat are prevailing. They are grown on a wide range of soils. However, they attain more prolific growth on well drained, sandy or silty -loam soils. Slightly acid soils to neutral (pH of 5.5 to 7.5) are desirable (Nonnecke, 1989). Sufficient soil moisture and relatively dry atmosphere are the major climatic requirements for economic production of Cucumis melos (McCollum, 1975). 2.2 Origin The genus Cucumis consists of 32 species, most of which are cultivated Cucumis melos (Kerje and Grum, 2000) Domestication of Cucumis melo seems to have started at least 3000 years ago (Pangalo, 1930). Africa is considered as a center of origin for Cucumis species with basic chromosome number n =12 (Pitrat et al., 2000). According to McCreight and Staub (1993), the center of origin of Cucumis melo is Africa, while the primary center of diversity is in South West and Central Asia. Whereas, Esquinas–Alcazar and Gulick (1983) considered South West and Central Asia as primary centers of diversity for Cucumis melo. Kamau (1996) standardized the existence and origin of plant species as the ecogeography of each species. He further divided the ecogeography of a plant species into the study of the distribution of the species in particular regions and ecosystems, patterns of inter spsific diversity and relationship between ecological conditions and the survival or frequency of variants. Accordingly, the International Plant Genetic Resources Institute (IPGRI) set xiv the priority of collecting Cucumis melo resources in different countries. India is known to be an important center of diversification of Cucumis melo followed by central Africa (Dogimont et al.1996). Mohamed and Taha (2003) considered Sudan to be a major center of Cucumis melo diversification.

2-7-3 ***Helianthusannuus***

Helianthus (*Helianthusannuus* L.) is an important oil crop in the world.In Sudan, the agricultural sector contributes to about 48% of the Gross Domestic Production (GDP) and to about 93% of the foreign currency earnings. It also employs about 65% of the labor force (Ministry of Finance and National Economy, 1996).Helianthus is a new edible oil crop and it considered as one of the promising crops recently introduced in Sudan. The seeds have an oil content of 40 - 50% and 30% digestible protein and can thus be used as a source of food for humans, or as poultry feed. The crop is sensitive to water stress during the flowering stage.It can be cultivated as winter crop under irrigated conditions and as summer crop under rainfed conditions. Helianthus produced good yields with only 300 to 500 mm of added water as stated by Weiss (1983).

2-8 Honey bee pastes

There are many pastes side effect of product honey bees

2-8-1***ANTS***

Ants are among the most common predators of honey bees. They are highly social insects and will attack the hives en masse, taking virtually everything in them: dead or alive adult bees, the brood and honey. In addition to this destruction, they can also be a nuisance to beekeepers under ant attack become aggressive and difficult to manage; weak colonies will sometimes abscond, which is also the defence of against frequent ant invasions.Many ant genera and species are reported to cause problems to both traditional beekeeping with.

Control

Beekeepers have found that the most effective method of controlling weaver ants is to search systematically for the ants' nests in

the vicinity of the apiaries and, when found, to destroy them by burning. Is to place the hives on stands supported by posts 30-50cm high and used engine oil or grease. Frequent inspection cleans of bridges of vegetation or earth that can be crossed by ants and liquids need to be replenished frequently.(Goodwin, M. & van Eaton, C.1999)

2-8-2*Varroa*

Varroa mites (*Varroa destructor*) are the most serious problem for honey bees,These mites infest and feed onthe blood of both adult and immaturetages of bees. , the mitescause extreme damage and death to honey bee colonies. Mature varroa mites are reddish brown and can be readily observed on white drone and worker pupae. (Marla spivak and Gary S. Ruter 2016)

Control

Chemical control is by far the most popular .A solution of 3ml of 60 percent formic acid is applied onto the sponge tissue per comb (Langstroh size).should be as far away from the brood as possible, the application can be repeated three to four times at intervals of at least seven days

2-8-3Birds

Birds That have been listed as attacking honey bees in Asia include bee-eaters .Commercial apiaries caused by predatory birds depends largely on the number of the predators and the intensity of the attack, the mere presence of a few predators in apiaries engaged in queen-rearing can inflict serious losses

Control

The apiary's bird problems by mass killing of the predators, hether by chemical or physical means or by gunsho

2-8-4wax mouth

The adult wax moth flies at night and easily finds and gains entry to even the strongest bee colony, her eggs and larvae , Hives that are weak and stored bee comb, however, may quickly be destroyed by the wax moth caterpillar. The caterpillar is actually after pollen and brood remains, not the wax, but it destroys the wax comb as it constructs its silken tunnels through the comb. Before turning into a pupa, the larva gnaws a boat-shaped indentation in the wooden frame or hive body to attach its silken cocoon. With heavy infestations, frame pieces may be weakened to the point of collapse.

Control

Strong s hives are the pest protection. Bee colonies should only have the comb they can protect.. Freezing and storage in air-tight containers and the eggs and larvae will be removed by beekeeping cleaning their hive. (MAAREC Publication 2000)

2-9-Economies of bee breeding in Sudan

There are about 50000 honey bees in the Sudan with an average of 4 cultivars each. This number is less than the rate of beekeeping of honey bee colonies in the Arab and world countries, which is 7.6 ultivars. This is due to the traditional method of bees, which is 99% We are talking about 1200 tons of honey per year and this represents about 9.07% of the Arab countries' total production at the rate of 6 kg for each group and 24 kg for each year. This productivity is twice as efficient as the Sudanese beetle compared to the Arab bee (51, 3 kg / year) and efficiently the global beekeeper (95.0 kg / year) and also put Efficiency when compared to community efficiency community International (12.5 kg \ swarming).

And we find that the agricultural area available to each community is much higher than the area actually produced in proportions ranging between 12.5 and 63 times and this refers to the question of the imbalance between vegetation and the preparation of bee communities through the study of the distribution of beekeepers and bee colonies and this reflects the poor interest in the referral in Sudan. In 1995, data on the price of honey were collected at the level of the product and the level of fragmentation. The local price was converted to the US dollar. The price of one kilogram of honey at the product level was $ 6.11. The breakdown is about 10.5 US dollars.

In the field of foreign trade, honey is an important source of foreign currencies and during the period from 1984 to 1995 of the last century was exporting natural honey from Sudan, an average of about 130 metric tons worth 67 thousand dollars and in the same period Sudan imported average honey 70 metric tons of value Take 40,000 US dollars. If Sudan produces 1200 metric tons of honey per year and exports 130 metric tons and imports 70 metric tons, Sudan's commodity balance will reach about 60 million metric tons at a value of 27,000 dollars. And becomes available for consumption about 1140 metric tons and thus achieve self-sufficiency of about 105.26 honey bees. If the population in 1995 was 21140000 people and that the available consumption of honey bee 1140 metric tons, or the average consumption of honey per person about 53.9 grams compared to the average consumption of the Arab citizen 125.5 gram.

We find that individual consumption of honey is determined by several factors, the most important of which are population growth, average per capita income and honey prices compared to prices of honey alternatives such as sugars, jams and price policies. We find that honey is

found in some Arab countries such as Saudi Arabia, the UAE and others (Elsarage 1988)

Honey is a rich source of readily available sugars, organic acids, lipids, various amino acids, vitamins, minerals, phenolic compounds, flavonoids, biologically active compounds such as aldehydes, nitrites(O.Dele 2017).

Honey consumers are particularly interested in the quality and source of the honey they buy. They rely on the physical characteristics such as color, aroma, and conventional methods in discerning good quality honey. Proline content, viscosity, refractive index and total sugar are important criteria for the determination of good quality honey. There is a need to verify the source of the product. This will help to reveal the possible presence of adulterants during honey processing. Assessing honey for quality control purposes requires determination of its pH, moisture, ash, total solids, sugar content (sucrose, glucose and fructose), viscosity, refractive index and specific gravity (N. Bradbear 2009).

Composition and quality honey (percentage sugar and water). Honey sold as such shall not have added to it any food ingredient, including food additives, nor shall any other additions be made other than honey. Honey shall not have any objectionable matter, flavour, aroma, or taint absorbed from foreign matter during its processing and storage. The honey shall not have begun to ferment or effervesce. No pollen or constituent particular to honey may be removed except where this is unavoidable in the removal of foreign inorganic or organic matter.

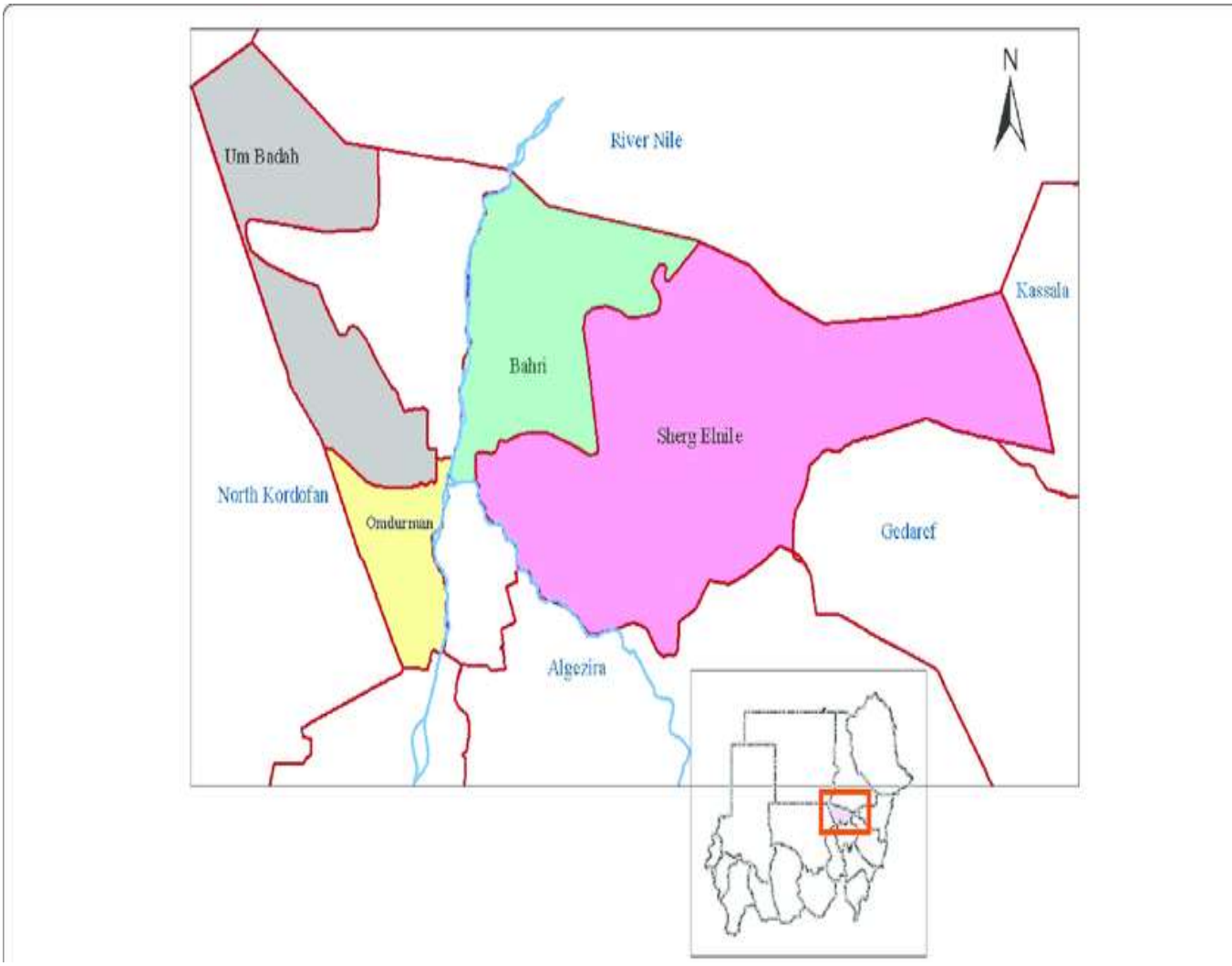
Honey shall not be heated or processed to such an extent that its essential composition is changed and/ or its quality is impaired. Chemical or biochemical treatments shall not be used to influence honey crystallization(CODEX STAN 12-1981) and FAO(1996).

Chapter three

3-Material and Methods

3.1. Study area: This study was conducted in Khartoum Statewhich is one of the eighteen States of Sudan. The city is located in the heart of Sudan at the confluence of the White Nile and the Blue Nile, where the two rivers unite to form the River Nile. Although it is the smallest state by area (22,142 km^2) . The state lies between longitudes 31.5 to 34°E and attitudes 15 to 16°N. It is surrounded by River Nile State in the north-east, in the north-west by the Northern State, in the east and southeast by the states of Kassala,Gedaref, white Nile and Gezira, and in the west by North Kurdufan.

The climate of Khartoum is tropical desert. There are three seasons per year, cool winter, dry summer and a rainy season. Highest temperatures (45°C or more) are recorded in summer months (May-June) while lowest temperatures (22°C or less) are recorded during winter months (November -January). The rainfall is about 150 mm per annum. The forest is flooded during the rainy season (July-October). Later, during winter and early summer, the forest becomes totally dry.(H. Altayeb,e t al 2003).



(figure 1) map of **Khartoum State)**
www,google amp of Khartoum State

3-2-Season of *Cucumismelo* and *Helianthus*

Field experiments were conducted at Soba project during the growing seasons in 2016. The farm lies on the eastern bank of the Blue Nile, approximately 20 km south of Khartoum. The main features of the climate of this area are the relatively cool winters, hot and dry summer seasons and the highly irregular annual rainfall. Meteorological data of the research site is given in Appendix 1. The soil is characterized by relatively high clay content (40 %), poor structure and extremely low organic matter content (Ibrahim and El–Karourri, 1983). The farm is located in the semi-arid× zone between Latitude 15–18 to 15– 22 and Longitude 32–52 to 32–57. The farm is irrigated by pumps stationing at the Blue Nile.

3-3-Season of *Acacianilotica*

Acacianilotica is a natural forest which borders the White Nile at the Mogran area, Khartoum. *Acacianilotica* forest is a unique biotope; a poor savannah habitat impeded in the semi desert background of Northern Sudan (Shawki & Musnad, 1964). As a consequence, the forest is characterized by high density of plant cover, mainly composed of *Acacia nilotica* trees (Mohamed, 1986; Ahmed, 1998). Moreover, it represents a hot spot of bird and invertebrate diversity. It has been estimated that the forest contains at least 70 bird species (among which 26 are migrants) together with a diverse invertebrate community (Cloudsely-Thompson, 1964; Nikolaus, 1987; Elobeid, 1990; Lado, 1994; Abd-Alrahman, 1998). The major environmental factor which underlies the unusual biodiversity at *Acacianilotica* forest is the annual floods of the Nile River, which supplies the site with immense amounts of water and nutrient-reach sediments. Thus, the *Acacianilotica* forest is considered as an inland wetland ecosystem (Altayeb & Hamed, 2003). This study was carried out in the *Acacia nilotica* Forest (15°35′N, 32°30′E) (Figure 1). The site is

bordered by the new White Nile Bridge from the North, the industrial area from the South, the Ghaba Street from the East and the White Nile from the West. Along the river bank there is a narrow cultivated area extending between the forest and the river bank

Figure (2) *AcaciaNiltica*

www,google.com picture ***AcaciaNiltica*** in Khartoum State

3-1Getting bees :-

Eleven Beehive Crinole honey bees swarms were bought from company Shahad in 23Augusts 2016. The bees on the limbs were taken in travelling boxes containing pieces of comb with brood, pollen and honey. The queen of each colony was then in queen caged with candy for two or three days after which it was released. Aweek last or each colony was rehived in a longstoroth hive . The eleven colonies were hived at *Acacia nilotica*,*Cucumismelo* and *Helianthus*is the respectively .

Laidlaw system (1958 was used to evaluate the behavior and production of honey bees. This system used breeding record which has a row at top for identification and other unchanging notation and columnar list for observation. The observation is recorded in terms of rating numbers 1to5, showing the poorest and the best respectively. The strength of the colonies was estimated in terms of combs.

3-2 Studybehaviorand production of crinole honey bees

3-2-1 Workers and droneBrood (opened andsoled)

The rate of growth and increase of brood in soled and open brood for honeybeeworkers, by periodic examination and measuring every 12 days, examining the rate of increase and growth in inches, and the measurement during the period from August 2016 to March 2017

The results were expressed in square inches for the worker and drone brood. Solidness was measured by counting a daren't 100 cells of sealed brood at random. the observation were recorded in terms of rating numbers 1to5 ; with being the poorest and5 the best (laidlow1958)be explained by the following description ;

5 zero to 3 empty cells per 100 cells sealed brood.

4:4to 7 empty cells per 100 cells sealed brood .

3:8 to 11 empty cells per 100 cells sealed brood.

2:12 to 20 empty cells per 100 cells sealed brood.

1: over 20 empty cells per cells sealed brood.

3-2-2Pollen collection

To evaluate the amount of pollen stored in the cells ,counts were made at 12 day intervals in the between frosty(*acaciaNilotic*) and sectors in the three flower season (*Cucumismelo and Helianthus*) using wire intersecting curves into square inches .counts were started on august 2018-apirl 2017.

The rating numbers according to laidlaw (1958) and Ali (1984)were used

5: towards sides and between brood and honey ,very few cells among brood .

4: Towards sides and between brood and honey, small amount among brood.

3: Zero

2: considerable pollen among honey.

1: solid combs among brood

3-2-3 Population

The strength of a colony was estimated in term of combs covered with bees on both sides for a nine month from August to April. The initial

average strength for each of the elven experimental colonies was five combs.

3-2-4 Honey production

Supers of empty combs were added to experimental colonies at the beginning of the nectar flow form *acacia'nileotca* , *CucumismeloHelianthus*

.the surplus honey was extracted at the end of the flow ,the amount of honey was determined by difference of com weight before and after extraction and was expressed in pounds per colony.

3-2-5 Swarming and migration:-

This was done by observing new queen cells and new queen in the colonies .besides that difference in colony strength was observed during inspections .Absconded in colonies were recorded.

3-2-6 Pests and diseases:-

Inspection of carniolian honey bees colonies was taken at 12 day interval for nine month .the pests diseases that had infected the test colines were observed and recoded in each are.

Statistical analysis:-

The data concerning the amount of workers and drone brood soled and open reared and pollen and honey stored was statistically analysed using the least significant difference (L.S.D) for the comparison between the tested colonies in the three season (*Acacianilotica* ,*Cucumis melo* and *Helianthus*) in state of Khartoum .

3-2 **Analysis sugar and** moisture

Honey contains nearly two hundred compounds which can be arranged, in to the following major groups: carbohydrates, amino acids, proteins minerals, vitamins, acids, esters and volatile components, hydroxyl methyl furfural (Ramchandra1987). Honey consists essentially of different sugars, predominantly fructose and glucose as well as other substances such as organic acids, enzymes and solid particles derived from honey collection. The colour of honey varies from nearly colourless to dark brown. The consistency can be fluid, viscous or partly to entirely crystallised. The flavour and aroma vary, but are derived from the plant origin (N. Bradbear 2009) .

Three Samples of honey((acacia , Cucumis melo and Helianthuss) were collected of breeding the cernioli bees with mobile in state Khartoum prepared in accordance with AOAC 920.180.

3-2Analysis method honey sugar

Honey contains nearly two hundred compounds which can be arranged ,into the following major groups: carbohydrates, amino acids, proteins Minerals, vitamins, acids, esters and volatile components, hydroxyl methyl furfural (Ramchandra1987).

Honey consists essentially of different sugars, predominantly fructose and glucose as well as other substances such as organic acids, enzymes and solid particles derived from honey collection. The colour of honey varies from nearly colourless to dark brown. The consistency can be fluid, viscous or partly to entirely crystallised. The flavour and aroma vary, but are derived from the plant origin

3-2-1 Essential composition and quality factors**:-**

Honey sold as such shall not have added to it any food ingredient, including food additives, nor shall any other additions be made other than honey. Honey shall not have any objectionable matter, flavour, aroma, or taint absorbed from foreign matter during its processing and storage. The honey shall not have begun to ferment or effervesce. No pollen or constituent particular to honey may be removed except where this is unavoidable in the removal of foreign inorganic or organic matter.

Honey shall not be heated or processed to such an extent that its essential composition is changed and/ or its quality is impaired chemical orbiochemical treatments shall not be used to influence honey crystallization(CODEX STAN 12-1981).AOAC international (1993) method analysis for nutrition labeling.

Sugar (Mono and Di), Glucose, Fructose, sucrose and maltose in presweetened cereals liquid. chromatographic sugar (Mono and Di) separation of sugars in honey liquid chromatographic method .Sugars (Mono and Di), separation of sugars in honey liquid chromatographic method .Honey are appropriately with diluted with water, filtered if required ,then chromatographic on HPLC column to separate the individual sugars .

Procedure sugar :-

Honey is dissolved in hot water, approximately 1g in10 mL water and filtered through 0.45µm membrane.

Standard sugar preparation:-

1. Prepare 2% of each individual sugar for determination of retention time.
2. Prepare 2%solution of sugar mixture for quantitative determination.
3. HPLC equipment and condition :

Column : Hypersil® (APS2) NH2,50.45um (thermo Hyperisl-keyston) with guard column,250×4.6(id)mm or equivalent .acetonitrile :distilled water :ethanol =82:17.5:0.5

Conditions : follow rate 1.5ml/min injector volume 20µl column temperature 25-30c° Rl detector temperature 25-30c°,Inject sugar standards and sample solution (10-20 µl),in to column with appropriate conditions and Measure areas

Calculation

$$\text{Amount of each sugar (g/100g)} = \frac{ASPL \times CsTD}{Astd} \times \frac{V}{W}$$

Where :A = area/peak height of each sugar in sample solution

A = area/peak height of sugar standard (g/100ml)

C= total volume of prepared sample solution (ml)

V= total volume of prepared sample solution (ml)

W= weight of sample (g)

Results are reported to the nearest 0.g/100g

ACCEPTANCE OP RESULTS:

Accept test results if following condition is satisfied.

10.1Duplicate results should not differ more than 10% of the mean.

Mean concentration of duplicate results of quality control sample or certified reference material should be with in ±2SDin control chart based on established acceptance criteria.

Appendix /supplementary notes.

Alternative HPLC equipment and condition .

Chromatographic condition 1.

Column: sugar –pak (cation exchanger) or sc-1011 with guard column ,300×6.5(id)mm or equivalent mobile phase : Distilled water containing Ca –EDTA50mg/1.

Detector: RI detector.

Conditions: follow rate 0.5ml/min injection volume 10µL column temperature 80-90c°. : RI detector temperature 40c° .

2-Chromatographic condition 11: column: Radial- pak silica cartidga (10cm×8mmID)in waters RCM -100 radial compression module .

3-preparation of conditioning reagent and modification of column .

4- mix 5 vials of WATERSTM SAM reagent 1with 15ml h2o.

5- add 385 ml of the above reagent through the capillary pipe of HPLC equipment .

6. Install the new silica pak column and pump all of the ml/min.Columns is ready for use.

7. Mobile phase is prepared as follows:

1. Mix 1 vial of WATERSTM SAM reagent 1 with 210 ml H2O

2. Add 770 ml acetonitrile, mix well.

3. Filter the solution through membrane filter FHUP 04700

4. Shake and digest the solution to eliminate the bubble from the mobile phase. Pass the mobile phase through the modified column prepared in point 11.2.2 and 11.2.3 with the follow rate of 3 ml/min.Discard the first 100 ml of the eluate .Collect the rest of the eluate for use as recycled eluent.

Detector: RI detector, at room temperature (25-30 °C).

Conditions: Flow rate 3 ml/min Injection volume 20 µLColumn temperature 25-30 °C RI detector temperature 25-30 °CChromatographic condition iii: column NH2 Rad –pak used with RCM8×10cartridag holder .Mobile phase Add1/2 bottele of PIC A/litre instead of SAM 1(this gives aconc of 2.5mMpic)

Chapter four

Results

4.1. The brood open and closed rearing and honey production and pollen grains collection.

Table (4.1) inch ² number bee means open brood and closed brood and production honey and pollen grains collection in *Acica Nilotica*, Cucumis melo and sunflowerseason.

Season	Open brood	Closed brood	Pollen	Honey	Power Farm	Number farm
Acica ilotica	**136.84^{a}±3.41**	**152.94 ^{a} ±3.10**	**22.96 ^{a} ±1.14**	**144.55 ^{a} ±4.65**	**4.14 ^{a} ±.09**	**5.05 ^{a} ±0.09**
Cucumis melo	**154.50^{b}±3.9**	**146.8 ^{a} 1±3.97**	**43.76 ^{b} ±3.25**	**147.53 ^{a} ±4.37**	**4.00 ^{a} ±.13**	**4.88 ^{a} ±0.10**
Helianthus	**155.83^{b}±5.95**	**147.30 ^{a} ±6.85**	**35.79^{c}±2.54**	**152.12 ^{a} ±6.82**	**3.62 ^{b} ±.20**	**4.26 ^{b} ±0.21**
Sig	NS	NS	*	**		

prepared source: Mona Ataeildeel

NS: No significant difference at (p≤0.05)

*: significant difference at (p≤0.05)

**: significant difference at (p≤0.01

a,b,c :suber ascabet with in same Colum .

As seen in table (4.1)Concerning showed thatpollen grains correlation between open brood in*acaciaNalatica*136.84^{a}±3.4, 154.50^{b}±3.9 and 155.83^{b}±5.95 . Close brood in*AcaciaNilotica*, *Cucumismelo*Farm 152.94^{a}±3.10,146.81^{a}±3.97 and 147.30^{a}±6.85. Pollen grains correlation between Brood in*AcaciaNilotica*trees ,*Cucumismelo* Farm and *Cucumismelo*Farm were 22.96^{a}±1.14, 43.76^{b}±3.25 and

35.79^{c}±2.54.Honey in*AcaciaNilotica*trees , *Cucumismelo*Farm and *Cucumismelo*Farm were 144.55^{a}±4.65, 147.53^{a}±4.37and 152.12^{a}±6.82. Power of ram in*Acacianillotica* trees , *Cucumismelo*Farm and *Cucumismelo*Farm were 4.14^{a}±.09, 4.00^{a}±.13and 3.62^{b}±.20. Number farm in*Acacianillotica*trees ,*Cucumismelo*Farm and *Cucumismelo*Farm were 5.05^{a}±0.09, 4.88^{a}±0.10 and 4.26^{b}±0.21.

Table (4.2) Queen in beehives during the Seasons in*Acacianilotica*,,*Cucumismelo*and *Helianthus*

Seasons	Yes	No
Acacianilotica	100	0
Cucumismelo	100	0
Helianthus	100	0

prepared source: Mona Ataeildeel

In table (4.2) concerning presences of queen in beehives during the all Seasons showed that 100 % in *Acacianilotica*,100 % *Cucumismelo*and 100 % *Helianthus*.

Table (4.3) Queen home beehives during the Seasons in *Acacianilotica*,, *Cucumismelo*and *Helianthus*

Seasons	Yes	No
Acacianilotica	4	96
Cucumismelo	0	100
Helianthus	0	100

prepared source: Mona Ataeildeel

Table (4.3) concerning presences about queen home beehives during the Seasons 0 % in *Acacianilotica*0 % ,*Cucumismelo*0 % *AcaciaNilotica,Cucumismelo*and *Helianthus*.

Table (4.4) Drone home in beehives during the Seasons in*Acacia nilotica,*Cucumis melo and Helianthus

Seasons	Yes	No
Acacianilotica	4	96
Cucumismelo	2	98
Helianthus	3	97

prepared source: Mona Ataeildeel

Table (4.4)concerning presencesdrone in beehives during the Seasonsshowed that in *Acacianilotica,(96)Cucumismelo*0% and *Helianthus*0%)

4.2. Bee Diseases, Bee pests andSpray in seasons *Acacianilotica,Cucumismelo* and *Helianthus*.

Table (4.5) Bee Diseases in beehives during the Seasons in *Acacianilotica,Cucumismelo* and *Helianthus*

Seasons	Yes	No
Acacianilotica	0	100
Cucumismelo	0	100
Helianthus	0	100

prepared source: Mona Ataeildeel

In table (4.5) concerning presences of diseases in beehives during the Seasons showed that 100 % in *Acacianilotica*,100 % *Cucumismelo*and 100 % Helianthus

Table (4,6) Hornet foundedduring the Seasons in *Acacianilotica*,*Cucumismelo* and *Helianthus*

Seasons	Yes	No
Acacianilotica	100	0
Cucumismelo	0	100
Helianthus	0	100

prepared source: Mona Ataeildeel

.Table (4.6) about Hornet presences of beehives during the Seasons 0 % in Acacia *nilotica*100 % ,*Cucumismelo*100 % *AcaciaNilotica*,*Cucumismelo*and *Helianthus*.

Table (4.7) Honey Bee pests founded during the Seasons in*Acacia nilotica*,Cucumis melo and Helianthus

Seasons	Yes	No
Acacianilotica	29	71
Cucumismelo	20	80
Helianthus	2	98

prepared source: Mona Ataeildeel

In table (4.7) concerning presences of showedbee pests beehives during the Seasons in *Acacianilotica 100% no* ,*Cucumismelo*and *Helianthus*

Table (4.8) Spray the pesticides beehives during the Seasons in *Acacianilotica*,*Cucumismelo*and *Helianthus*

Seasons	Yes	No
Acacianilotica	16	84
Cucumismelo	23	77
Helianthus	0	100

prepared source: Mona Ataeildeel

table (4.8) concerning presences of showed 71 % spray in Acacia *nilotica* , %80,*Cucumismelo* and 98 % there yes showed that 29 % *Acacianilotica*,20%*Cucumismelo*and 2%*Helianthus* .

4-3Analysis honey bees sample

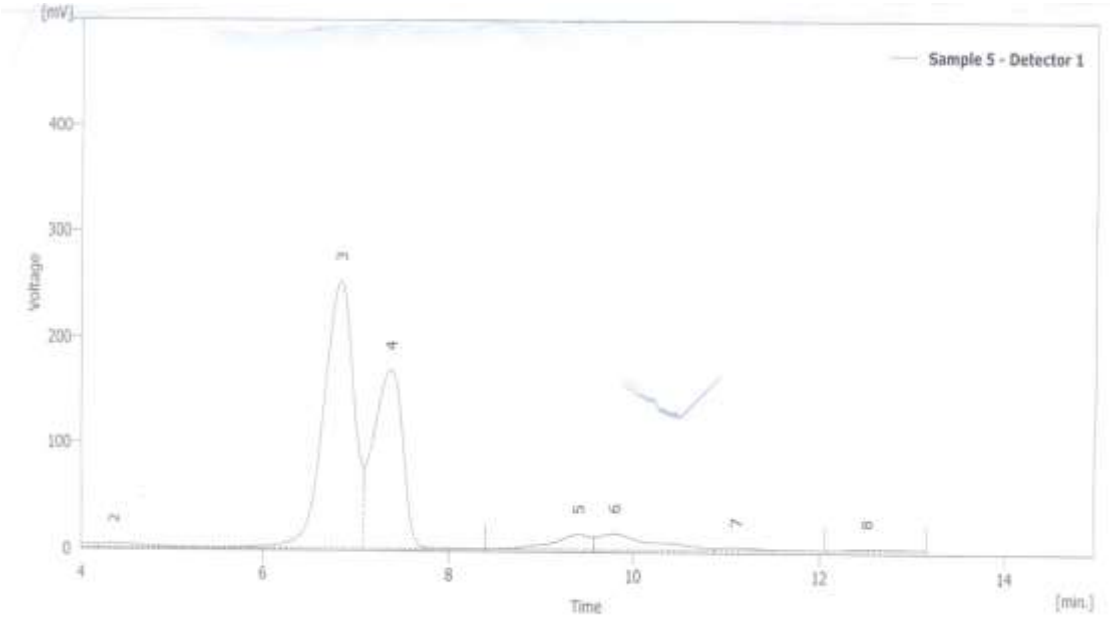
Samples collected experiment analysis honey bee sugar and water from the end of each season in *Acaiaca Nilotic*a, *Cucumismelo* and *Helianthus*.

Table (4.9)*AcaiacaNilotic*honey analysis sugar water content and showed RI.

Sample	Fructose%	Glucose %	Sucrose%	Maltose %	Lactose%	RI	Water content%
Acaiaca Nilotic	37.4754	25.1789	4.1898	4.0913		1.5079	13.00

prepared source: Mona Ataeildeel

In table (4.9)concerning analysis sugars in *AcaiacaNilotic*a showed that Fructose 37.4754 %, Glucose 25.1789 %, Sucrose 4.1898 % , Maltose4.0913%,Lactose 2.3795 %.



Area [mV.s]	Height [mV]	Area [%]	Height [%]	Resolution [-]
2748.867	171.179	20.6	27.4	
4767.913	214.070	35.8	34.3	6.384
3548.865	160.886	26.6	25.7	0.870
538.076	20.307	4.0	3.2	3.140
651.030	22.861	4.9	3.7	0.488
530.492	15.896	4.0	2.5	0.571
519.518	18.655	3.9	3.0	0.771
20.425	0.975	0.2	0.2	2.501
13325.186	624.828	100.0	100.0	

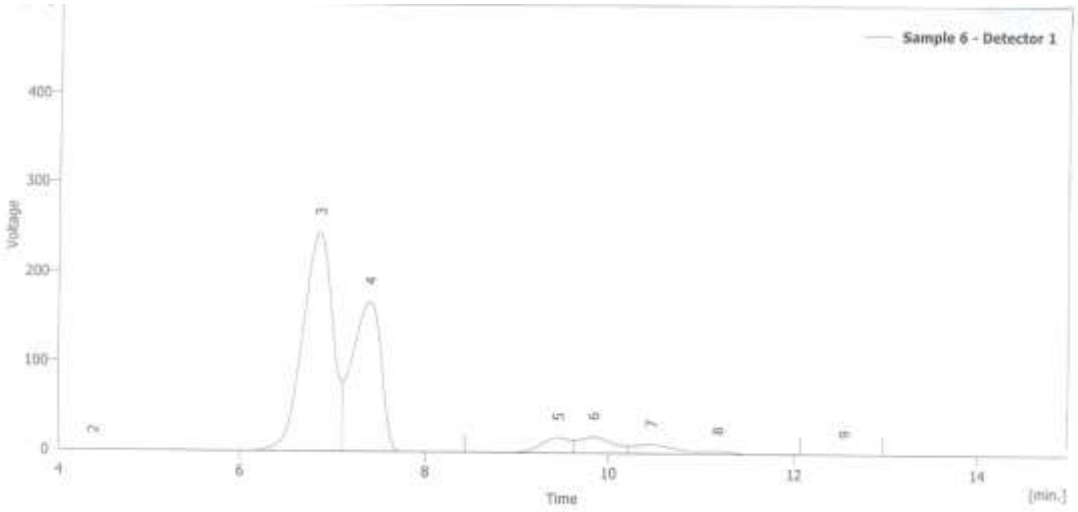
. **Fig (1)** *AcaiacaNilotic* honey analysis sugar, water content and RI

Table (4.10) honey *Cucumismelo* analysis sugar , water content and RI.

Sample	Fructose%	Glucose %	Sucrose%	Maltose %	Lactose%	RI	Water content%
Cucumis melo	37.3089	24.6624	3.3072	4.4599	2.3795	1.4989	15.20

prepared source: Mona Ataeildeel

As seen table (4.10) about *Cucumismelo* analysis sugars showed Fructose 37.3089%, Glucose 24.6624%, Sucrose 3.3072%, and Maltose 4.4599%, Lactose 2.3795% receptivity.



Result Table (Uncal - Sample 6 - Detector 1)

	Reten. Time [min]	Area [mV.s]	Height [mV]	Area [%]	Height [%]	Resolution [-]
1	3.503	2853.328	188.890	20.3	28.3	
2	4.370	95.816	3.059	0.7	0.5	1.376
3	6.847	5732.361	247.455	40.7	37.1	3.438
4	7.390	3760.053	170.631	26.7	25.6	0.844
5	9.443	498.750	19.285	3.5	2.9	3.041
6	9.830	557.382	20.047	4.0	3.0	0.466
7	10.457	419.085	12.044	3.0	1.8	0.623
8	11.173	143.201	4.963	1.0	0.7	0.793
9	12.543	29.755	1.274	0.2	0.2	1.751
	Total	14089.733	667.648	100.0	100.0	

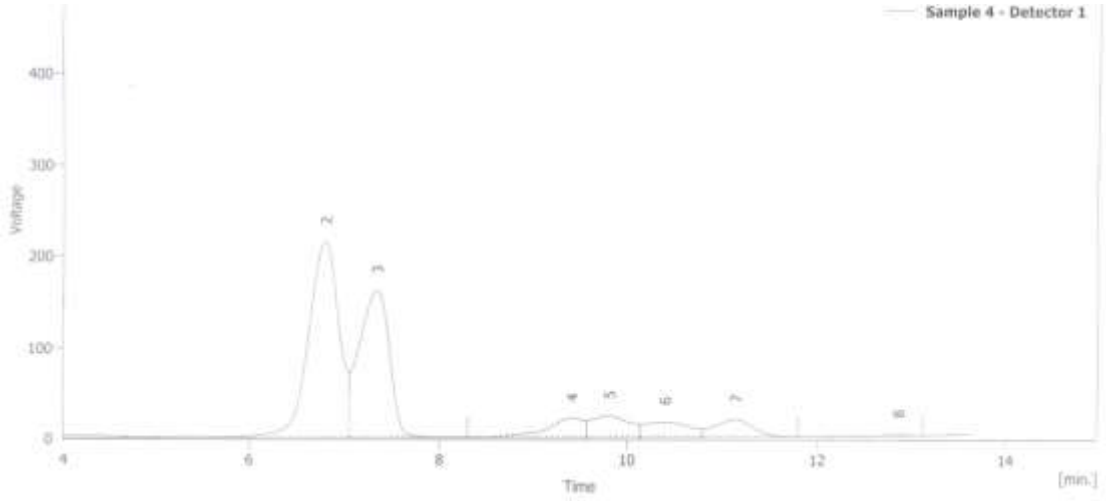
Fig (2) honey *Cucumismelo* analysis sugar , water content and RI.

Table (4.11) honey *Helianthus*analysis sugar water content and RI.

Sample	Fructose%	Glucose %	Sucrose%	Maltose %	Lactose%	RI	Water content%
Helianthus	31,3949	23.7647	4.5202	4.7787	3.0120	1.5069	13.00

prepared source: Mona Ataeildeel

In table (4.11) concerning*Helianthus*analysis sugars showed fructose 31,3949%, Glucose 23.7647%, Sucrose 4.5202%, Maltose 4.7787%, Lactose 3.0120% .



Result Table (Uncal - Sample 4 - Detector 1)

	Reten. Time [min]	Area [mV.s]	Height [mV]	Area [%]	Height [%]	Resolution [-]
1	3.500	2748.867	171.179	20.6	27.4	
2	6.800	4767.913	214.070	35.8	34.3	6.384
3	7.343	3548.865	160.886	26.6	25.7	0.870
4	9.410	538.076	20.307	4.0	3.2	3.140
5	9.807	651.030	22.861	4.9	3.7	0.488
6	10.400	530.492	15.896	4.0	2.5	0.571
7	11.147	519.518	18.655	3.9	3.0	0.771
8	12.857	20.425	0.975	0.2	0.2	2.501
	Total	13325.186	624.828	100.0	100.0	

Fig (3*Helianthus*) honey analysis sugar water content and RI.

Table (4.12) sugar analysis honey different season and plant

Sample	Fructose%	Glucose %	Sucrose%	Maltose %	Lactose%	RI	Water content%
Helianthus	31,3949	23.7647	4.5202	4.7787	3.0120	1.5069	13.00
Cucumismelo	37.3089	24.6624	3.3072	4.4599	4.0854	1.4989	15.20
Acaiacanilatica	37.4754	25.1789	4.1898	4.0913	2.3795	1.5079	13.00

prepared source: Mona Ataeildeel

Table (4.12) Composition, Comparatives and quality honey (sugar and water percentage) Between FAO AND DIFFERNT SEASON AND PLANT.

Table (4.13) FAO stander analysis sugar honey bees

Parameters	FAO stander
Fructose%	38.19
Glucose %	31.19
Sucrose%	1.31
Maltose %	7.31
Lactose%	
Water %	18%

Table (**4.14) Sudan stander analysis sugar honey bees**

Parameters	Sudan stander
Fructose%	38.2
Glucose %	31.3
Sucrose%	1.3
Maltose %	7.3
Lactose%	0.14
Water %	18%

4.4. Type of project, Level of education, Date of establishment, Type of apiary, Source of bee colonies, Import equipment and Number of Carnelian:

Table (4.15) Type of bee project

Type of project	Frequency	Percentage
Privet	9	56.2
Government	7	43.8
Total	16	100

prepared source: Mona Ataeildeel

Table (4.15) Concerning theprojecttype showed that 56.2% private while 43.8% government.

Table (4.16) Level of education

Level of education	Frequency	Percentage
Secondary	7	43.8
Basic	3	18.8
University	3	18.8
Illiterate	2	12.5
Post Graduated	1	6.1
total	16	100

prepared source: Mona Ataeildeel

In table (4.16) aboutbeekeeper education level 43.8 % Secondary, 18.8% Basic, University, 18.8% 12.5% Illiterate and 6.1%Post Graduated.

Table (4.17) Date of establishment apiary

Date of establishment of beekeeping	Frequency	Percentage
Less than 5years	9	56.2
More than 10 years	6	25.0
5-10 years	1	18.8
Total	16	100

prepared source: Mona Ataeildeel

Table (4.17) concerning that date of apiary establishment showed that 56.2% less than 5years , 25% between 10-50 while 18.8% years more than 10 years.

Table (4.18) Type of apiary

Type of apiary	Frequency	Percentage
Carniolan honeybees	9	56.3
Both (Carniolan+ Sudani)	5	37.5
Sudanese honeybees	1	6.2
Total	16	100

prepared source: Mona Ataeildeel

In table (4.18) About type honeybees apiary 56.3 % Carniolan, 37.5% Both (Carniolan+ Sudanese) and 6.2% Sudanese honeybees.

Table (4.19) Source of bee colonies

	Frequency	Percentage
local domestic	9	56.3
Hunting bees	6	37.4
Import	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.19) about Source bee colonies showed that 56.3% local domestic, 37.4% hunting wild bees and 6.3% Imported.

Table (4.20) Imported equipment or domestic industry.

	Frequency	Percentage
Imported	14	87.5
Local	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

In table (4.20) Concerning equipment that showed 87.5 % Imported 12.5% local.

Table (4.21) Reason for imported equipment

Reasons	Frequency	Percentage
There is no local industry	7	43.8
High quality of important	6	37.4
Others (Such as local clothes)	3	18.8
Total	16	100

prepared source: Mona Ataeildeel

In table (4.21) About imported equipment beekeepers showed that 43.8% there is no local industry, 37.4 high quality and others 18.8.

Table (4.22) Number of Carnelian Hivespresent with the beekeeper

Number of Carnelian Hives	Frequency	Percentage
Less 500	10	62.2
Between 500-1000	3	18.8
More 1000	3	18.8
Total	16	100

prepared source: Mona Ataeildeel

Table (4.22) Concerning havenumber of Carnelian hive per beekeeping showed that 62.2 % Less 500, 18.8% having between 500-1000 but 18.8% more 1000 hives.

4.5. Age of the Carniolan, Lost percentage of cells per year, Causes of loss of bees Combine, Which ever you prefer breeding Sudanese or Cornioles bee Sudanese bees, Characteristics of the Carniolans and The age of the Carniolan bees:

Table (4.23) Age Carniolan bees in in the beehive

The age of the Carniolan bees in in the beehive (in year)	Frequency	Percentage
One year	5	31.3
Two years	8	50.0
Others (1 -2)	2	12.5
More than two years	1	6.2
Total	16	100

prepared source: Mona Ataeildeel

Table (4.23) concerningCarniolan bees age in hive showed that 50% two year,%, 31.3 % one year's 12.5% others and6.2% more two years.

Table (4.24) Lost percentage of beehavies per year

Lost percentage of cells per year	Frequency	Percentage
Less than 5%	5	31.2
Less than 5%-10%	4	25.0
More than 10%	7	43.8
Total	16	100

prepared source: Mona Ataeildeel

In table (4.24) about season lost ration cells per year showed that 43.8% 10% . 31.2% less 5% percentage and 25.0% more than less 10% percentage.

Table (4.25)causes of honey beeloss

Honey bee causes loss	Frequency	Percentage
Negligence of Technical	7	43
Pests and diseases	5	32
Combine weak cells	4	25
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.25) lossCarniolan reason showed that 43% loss bees causes negligence of technical, 32% Pests and diseases and 25 % Combine cell .

Table (4.26) Honeybee preference

Type	Frequency	Percentage
Corniole honeybees	9	56.2
Sudanese honeybees	7	43.8
Total	16	100

prepared source: Mona Ataeildeel

Table (4.26) about bees prefer 56.2 % Carniolan bees while 43.8% bees Sudanese.

Table (4.27) Carniola's honey bee Characteristics

Characteristics of the Cornioles	Frequency	Percentage
Easy to treat	14	87.4
High production	1	6.3
Others (no migration)	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.27) ConcerningbeesCorniolans characteristics showed that 87.4% easy treat 6.3 % high production and 6.3% others.

Table (4.28) Sudanese honey bee Characteristics

Characteristics of the Sudanese	Frequency	Percentage
Others (aggressive)	10	62.4
High production	5	31.3
Cheap	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

Table (4.28) fig. (24) About bees Sudanese characteristics showed that 62.4 % others while31.3 % high production and6.3 % cheap

4.6.type of breeding, Characteristics of Modern and Characteristics of traditional:

Table (4.29) Type of breeding

type of breeding	Frequency	Percentage
Modern	16	100
Traditional	0	0
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.29) Concerning breeding honey bees type showed that 100 % modern while 0% traditional.

Table (4.30)ModernTypes

Characteristics modern	Frequency	Percentage
High production	16	100
Cheap	0	0
Total	16	100

prepared source: Mona Ataeildeel

Table (4.30) Aboutmodern Characteristics showed 100% high production 0% cheap.

Table (4.31) TraditionalType

Characteristics of traditional	Frequency	Percentage
High product	14	87.5
Not expensive	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

In table (4.31)concerningtraditional Characteristics showed 87.5% High production and 12.5 % no expensive.

4.7.activities with breeding honey bees and if answer:

Table (4.32) do you have any other activities with honey bees breeding

If it is anther activities with breeding bees honey	Frequency	Percentage
No	10	62.5
Yes	6	37.5
Total	16	100

prepared source: Mona Ataeildeel

Table (4.32) Aboutbreeding honey beeand anther activities showed that 62.5% no activities while 37.5 % activities yes.

Table (4.33) If yes, you have another activities with honey bee breeding

Reason	Frequency	Percentage
There is no flowers in certain time	11	68.8
There is no bee in certain time	3	18.8
Others (climatic factors)	2	12.4
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.33) Concerning yes another activities showed that 68.8% no flowers, 18.8% there is no bee in certain time while 12.4% others

4.8.Do you have workers in beekeeping, if answer yes, you have workers and the number of workers:

Table (4.34) Do you have workers in apiary

	Frequency	Percentage
Yes	11	68.8
No	5	31.2
Total	16	100

prepared source: Mona Ataeildeel

In table (4.34) About worker in apiary yes or no showed that 68.8% yes while 31.2% no.

Table (4.35) Do youhave workers in apiary if answers yes

	Frequency	Percentage
The worker's volume	8	50
Project area	6	37.5
Others	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

Seen table (4.35) Concerninganswеryes showed that 50% work volumes while 37.5% area big Project and 12.5% others.

Table (4.36) workerstype

workers type	Frequency	Percentage
Permanent	16	100
Seasonal	0	0
Total	16	100

prepared source: Mona Ataeildeel

In table (4.36) Aboutworkers type showed that 100 % Permanent while 0% seasonal.

4.9. training courses in the field of bees, Is the training internal or external, Number of training courses, Responsible for training of beekeeping , Skills of technical workers and Do you require a specific type of training:-

Table (4.37) Have you received training courses in this field

Training courses	Frequency	Percentage
Trained	13	81.2
Not trained	3	18.8
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.37) Concerning worker training courses in the field sowed that 81.2 % training courses while 18.8 % there is no training.

Table (4.38) Type of training

Is the training internal or external	Frequency	Percentage
Internal	14	87.5
External	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

Showed table (4.38) Aboutinternal training or external showed that 87.5 % internal training courses while12.5 % external training courses.

Table (4.39) Number training courses in beekeeping field

Number of training courses in the field of beekeeping	Frequency	Percentage
ONE	4	25
TWO	1	6.2
MORE THAN TWO	11	68.8
Total	16	100

prepared source: Mona Ataeildeel

In table (4.39) Concerning number of courses showed that 68.8 % more than 3 while 25% one and 6.2 % two courses.

Table (4.40)Sectors for training of beekeeping

sectors for training of beekeeping	Frequency	Percentage
Private sector	3	18.8
Organization	1	6.2
Government sector	5	31.2
Others (personal)	7	43.8
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.40) About sectors for training showed that 43.8%others, 31.2 % sector government , sector Private 18.8% and 6.2%sector Organization.

Table (4.41) WorkersSkill

workers	Frequency	Percentage
Skilled	16	100
Not skilled	0	0
Total	16	100

prepared source: Mona Ataeildeel

Table (4.41) concerningworkerSkills showed that 100% Skills 0% not skill.

Table (4.42) needs for specific training

	Frequency	Percentage
need	15	93.7
No need	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.42) aboutwhere workers require specific training showed that 93.7 % specific training while 6.3% workers specific training.

Table (4.43)Field of the training

field	Frequency	Percentage
Coursestraining in field	13	81.2
Out field	3	18.8
Total	16	100

prepared source: Mona Ataeildeel

Table (4.43) aboutcourses training in field showed that 81.2 % training courses while 18.8 % not training courses.

Table (4.44) Reasons for specific training

	Frequency	Percentage
A. Control pests and diseases	6	37.5
B. Increase Productivity	4	25
C. Others (new methods)	4	25
D. A and b	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

In table (4.44) concerningrequired a specific training showed that 37.5% Control pests and diseases, 25.0% increase Production while12.5 (A and B).

4.10: Honey bee plant environment

Table (4.45) bee keeper's plant environment depend on.

bee plant environment depend it	Frequency	Percentage
others (not irrigated)	6	37.5
Sector irrigated	5	31.3
Forestry	4	25
All that is said	1	6.2
Total	16	100

prepared source: Mona Ataeildeel

As seen table (4.45) aboutplant environment type showed that depends 37.5% others, 31.3% sector irrigated , 25.0% frosty and 6.2% all that is said.

4.11. honey type produced

Table (4.46) types of honey produced

Type of honey	Frequency	Percentage
Forest honey	10	63.3
irrigation honey	5	31.3
others honey (not irrigation)	1	6.4
Total	16	100

prepared source: Mona Ataeildeel

In table (4.46**)** Cornicing honey bee produced showed that **63.3**%Forestry, 31.3 % irrigation and 6.4% others.

Table (4.47) Average production of honey in kg or tons

Average production of honey in kg or ton	Frequency	Percentage
Kg	15	93.7
Ton	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

Table (4.47) about type per production showed that 93.7 % **kg** while 6.3% ton.

Table (4.48) honey bee products

products of bees	Frequency	Percentage
Honey	15	93.7
Other (pollen grains/ propolis/ royal gelly)	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.48) Showed that production kind showed that 93.7 honey while 6.3% others.

4.11.use industrial nutrition, Period of industrial nutrition, the effect of artificial feeding on bees, the average cost of industrial nutrition:

Table (4.49) Type of industrial nutrition used

industrial nutrition	Frequency	Percentage
Yes	16	100
No	0	0
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.49) Cornicing use industrial nutrition showed that 100%beekeepers while 0% didn't use .

Table (4.50) Period of industrial nutrition between the end of each season and the beginning of the flowering season

Period of industrial nutrition between the end of each season and the beginning of the flowering season	Frequency	Percentage
One weeks	0	0
1-2 weeks	16	100
3-4 week	0	0
Total	16	100

prepared source: Mona Ataeildeel

Table (4.50) about Period of industrial nutrition showed that 100% two weeks between season beginning of the flowering , 0% one week and three weeks 0%.

Table (4.51) The negative effect of artificial feeding on honeybees

The effect	Frequency	Percentage
Increase Pests	11	68.8
Bee escape	4	25.0
Weak egg laying for the queen	1	6.2
Total	16	100

prepared source: Mona Ataeildeel

Table (4.51) Cornicing effect side industrial nutrition showed that 68.8 % Increased Pests while 25% bee escape and 6.2% was a few queen eggs.

Table (4.52) The average cost of industrial nutrition for 10 beehives

Average cost in pound	Frequency	Percentage
50 pound	1	6.3
50-100pound	3	18.8
100 – 150 pound	3	18.8
More than 150	9	56.1
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.52) about industrial nutrition the for 10 cells per pound showed that 56.3 % period more than 200 -250 pound , 18.8% between 200-150 Pound, 18.8% between 150-100 others and 6.3 % Pound 50.

4.12: pests, controlling pests, and cost control of pests:

Table (4.53) Presence of pest

Presence	Frequency	Percentage
presnet	15	93.7
Not present	1	6.3
Total	16	100

prepared source: Mona Ataeildeel

Table (4.53) concerningIf there are pestsshowed that 93.8 % there pests while 6.2 % there no pests.

Table (4.54) if present, the ways to combat with it?

What are the ways to combat it	Frequency	Percentage
chemical Ways	9	56.2
biological Ways	1	6.3
All said (chemical and biological)	6	37.5
Total	16	100

prepared source: Mona Ataeildeel

Table (4.54) about ways to combat it showed that 56.2% chimerical while 37.5 % ways biological 6.3% others.

Table (4.55) Cost of Controlling pests expensive or inexpensive

Cost	Frequency	Percentage
Expensive	11	68.2
Inexpensive	5	31.8
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.55) concerning control pests showed that 68.8 % it expensive while 31.2. %. not expensive

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Table (4.56) Cost of Controlling pests.

Cost control of pests (pound)	Frequency	Percentage
About 250	7	43.8
250-500	5	31.2
500-750	2	12.5
More than 750	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.56) About cost control of pests pound showed that 43.8 % about 250 pound , 31.3 % , about 250-500 pound while 12.5 %, 500-750 pound and more than that .

Table (4.57) Honey bee diseases

Bee diseases	Frequency	Percentage
No	16	100
Yes	0	0
Total	16	100

prepared source: Mona Ataeildeel

Table (4.57) Aboutare there diseases showed that 93.8 % yes while 6.2 % no.

4-3-10 Marketing, best-selling product, products enter the circle of the national economy, and sophisticated marketing method:

Table (4.58) Type of Honeybee Marketing

Type	Frequency	Percentage
Local marketing	11	68.7
internationalmarketing	5	31.3
Total	16	100

prepared source: Mona Ataeildeel

Table (4.58) about marketing products showed that 68.7% local while 31.3% external export.

Table (4.59) Honeybee Marketing Constraints

Marketing Constraints	Frequency	Percentage
The product has no interest from the state	11	68.7
A lot of cheating	5	31.3
Total	16	100

prepared source: Mona Ataeildeel

In table (4.59) concerning marketing Constraints showed that 68.7% product has no interest from the state while 31.3% cheating.

Table (4.60) Honeybee product sales in the market

Best of selling product on the market	Frequency	Percentage
Honey	14	87.5
Others (pollen grain, royal gelly)	2	12.5
Total	16	100

prepared source: Mona Ataeildeel

In table (4.60) concerning best-selling product market showed that 87.5% honey roily gel 12.5.

Table (4.61) Can honeybee products enter the national economy income

	Frequency	Percentage
Enter	16	100
Not Enter	0	0
Total	16	100

prepared source: Mona Ataeildeel

In table (4.61) can be products enter the circle of the national economy showed that 100% yes 0% no.

Table (4.62) canhoneybee products be produced in Sudan

can be produced yes or no	Frequency	Percentage
Yes	16	100
NO	0	0
Total	16	100

prepared source: Mona Ataeildeel

As seen in table (4.62) about can be product showed that 100 % yes can be 0% no .

Table (4.63) The reasons for honeybee product not to enter national economic income

Reason	Frequency	Percentage
There are no sophisticated marketing methods	12	76
Storage and packaging	3	18.8
Production not available	1	6.2
Total	16	100

prepared source: Mona Ataeildeel

Table (4.63) about if there are no sophisticated marketing methods

76 %, Storage and packaging18.8%, and 6.2% . Production not available.

5-Chapter five

DISCASSION

Beekeeping is an important source of livelihood in agricultural societies. Beekeepers can be described as mobile beekeepers or stationary beekeepers in terms of managing their colonies. For mobile beekeepers, it is extremely important to seasonally collect nutrients because of the variety of flowering periods of the forage plants of bees. It is necessary for the beekeepers to take their colonies to areas with nectar and pollen, both temporally and spatially well defined. Beekeepers can take their colonies several times over the course of the year. Here the beekeeper aims to achieve maximum production.

The present result aboutrelationship betweenstored pollen grains, brood solid and population bee (combs covered with bees on both sides framein beehive)in farms*Cucumismelo* and *Helianthus*showedthat wascorrelation significant between pollen grains, population and brood , this in agreement with Taha *eatl;*(2013)and Awad*etal;*(2016).

The studyconcerning interconnection between stored pollen grains and brood solid in *Acacianilatica* forest state Khartoum showed that was no signified correlation this is agrees with Hussein(2000) and Sunita(2000).

The study result about relation between production honey,population sizein beehive and number framethat with regard to significantcorrelationbetweenhoney production and population size,this in lineTikrity *et al;* (2015).

The present result aboutpresences queen in three season showed that hundredpercentage presences,this inrelevant with Ali (1988) and Babay (2011) .

The study resultconcerning presences Queen home showed that queen homein*Acacianilatica*was highest96%, this inagreement with, Abrol,(2010).

The present result about drone showed that drone was highest 96 %.This in agreementwith .Ali (1988).

The present result withregard to Hornet showed thatHoney thundredpercentagefounded.This in similar with Ali (1989).

The present result about analysis of water in Helianthus*Cucumismelo* and *AcaiacaNilotic*, indicatethat 13.*00% Acaiacanilotica,15.20 %Cucumismelo*and 13.00 %*Helianthusin line to* water in honey standard measure in FAO18%.

The study result referred to analysisFructose%*HelianthusCucumismelo* and *acacianlatica* showed that 37.48 *Acaiaca nilotic37.31 %,Cucumismelo*and 31,39 %*Helianthusin line to* Fructose% in honey standard measure in FAO44%.

The presentinvestigation with reference to analysis of Glucose %*Helianthus,Cucumismelo* and *Acacianlatica* showed that 25.18 *% Acaiacanilotic*,24.66 % *Cucumismelo*and 23.76 %*Helianthus*confirm *to* Glucose % in honeystandard measure in FAO44.26 %.The presentstudy with regard toanalysis of Sucrose% in *HelianthusCucumismelo* and *Acacianlatica* showed that 4.19 *% Acaiaca nilotic3.30 %,Cucumismelo*and 4.52%*Helianthusconfirm to* Sucrose% in honey standard measure in FAO7.57%.

The presentinvestigation with respect to analysis of Maltose % in Helianthus*Cucumismelo* and *acacianlatica* showed that 4.09 %*Acaiacanilotic*4.*46%,Cucumismelo*and 4.78 %*Helianthussimilar to* Maltose %in honey standard measure in FAO15.95%.

The presentstudy concerning to analysis of Lactose% in *HelianthusCucumismelo* and *acacianlatica* showed that 2.38 % *AcaiacaNilotic* *4.09%Cucumismelo*and 3.01 %*Helianthus*.

The present result concerning project type showed that private sector washighest 56.2%.Thisinagreement with Esarreg (1981).The study investigationaboutbeekeeper education levelobtained thatsecondarylevel educationwas highest 43.8%. This in agrees withMartin (2011).

The study result with regard todate establishment apiary exhibited thatdate between 5- 10 years wasbiggest56.3%.This inlineEisa and Roth(2008)

The present result about type honeybeeapiary showed that Carniola highest was56.3 %.Thisconfirm with Hussein (2000).

The presentstudysource bee colonies showed that sourcebee colonies local domestic was biggest56.3%.Thisaccordance with FAO (2011).

Thepresent investigationreferring toimported or local industryequipment showed thatequipment Import was highest 87.5 %.This Similar to report animal resources (2014).

The presentinvestigationif answer was imported equipment exhibitedshowed thatthere is no local industry that was highest 43.8%. This is agreement with Hussein (2000). Thestudy resultreferring tonumber havingCarniolanhives showed thatbetween 500-1000 beekeeper was biggest 62.4%.This in accordance with Dewey(1999). The present resultconcerning age Carniolan in beehive showed thattwo years age bee Carniolan.This issimilarto Elssarge (2012). The present result with respect to lost percentage honey bee per year showed that more than 10%lost was biggest 43%.This in line withReyesTirado (2013). The studyresultabout loss Carniolan reason showed thatthere were negligence technical was highest 56.2%, this in agreement Martin(2011).

The presentresult with respect to beesCorniolan characteristics showed thatbeeCorniolanhigh productionwas biggest87%, this is relevant toKaobe *et al;* (2009).

The present concerning breeding honey beetype showed that Carniolan bee preferred was highest56.2%, itagrees with (Eisa and Roth(2008). The present resultabouttype breeding exhibited that hundred percentage modern breeding.Illuminated High production hundred percentage, this line with Eisa and Roth (2008).

The present investigation modernCharacteristics obtained High productionhundred percentage, thisin similar Martin,*etal: (*2011).

The present resultconcerningif another activities with breeding honey bees showed thatthere no activities highest was 62.5%.This in agreement withRakesh (2014).

The present result about having workerapiary yes or no showedthat werehaving workerswas highest 68.8%.This in agreement withMartin*etal*;(2011).

The present result about workers type showed that was hundred percentage Permanentworkers.Thisin agreement withMartin,*etal*;*(*2011).

The present result concerning worker training courses in the field yes or no showed thatobtained yes workers received training was biggest81.2 %,thisin accordance toMartin*etal*; (2011).

The study result about internal training or external recorded that internal training courses were highest87.5%, this in agreement withMartin,*etal*;*(* 2011).

The present result concerning number training courses in field beekeepingshowed thatmore than training3courses werehighest 68.8 %, thisin accordance withFOA *(*2011).

Thestudy resultreferring sectors for training beekeeping showed thatresponsible training otherswerehighest43.8 %, thisin similar withReport MinistryAnimal Resources (2017).

The present resultconcerningworkerskills showed that was hundred percentage skillful technical, this in similarMartin,*etal*; (2011).

The study resultconcerningdid were workers require specific training exhibited that93.7% were require specific training, this in line with (Aslarage 2012).

The presented resultedaboutcourses training in field showed thatcontrol pests and diseases was highest 81.2 %, the present resultconcerningworkers received training courses in our out filed ,showed that they were training in filed was highest 81.2%, this inagreement with Martin (2011).

The present result about bee plant environment depend it showed that37.5 % than others they said.Thisin agreementwith Elnebir (2015) and Alssrage (1981).

The present result with regard to honey bee production showed thathoney forestrywas highest 63.3%, this inagreement with El-Nebir (2015).

The present resultabout Average production honey in kg or tonshowed that kg production was highest 93.7 %, this in agreementwith, Elssarg(1981).

The present result about use industrial nutritionshowed that washundred percentages used it This in agreement with Moeller (1977).

The study result about industrial nutritionPeriod between flowering first season showed that two weeksPeriod washundred percentage,this in agreement with Moeller *(et.al* 1977).

The present resultreferring to effect industrial nutrition showedthat increase pests was highest 68.8 %.This in agreement with Moeller *(*1977).

The present resultabout average industrial nutrition cost 10 beehiveshowedthat more than 200-250 SDGsindustrial nutritionwas highest56.1 %.Thisin agreement with Moeller *(*1977) . The present resultconcerning if there werefounded pests biggest 93.8 %.Thisin agreement with FAO (2006). The present result concerningwhat is ways combatshowed that chemical combatwas highest 56.3%.Thisinagreement withEl-niweiri(1998). The present result aboutcontrol pests expensive or inexpensive showedthat expensivepests controlwere 68.8 %.This inagreement withEl-niweiri(1998). The present result cost control pests showed that 43.8 %, said more than 750SDGs.This in agreement withEl-niweiri(1998). The present result about are there diseasesshowed that hundred percentagethere were no diseases, disagree withAli(1989)they were found some diseases like Serratia disease it may be due to good management.The present result marketing local or external showed that87.5% products local marketing .This in agreement withUNDP(2012).The present result concerning best-selling product market showed that selling market honey was biggest 87.5%.Thisin agreement with.El-Nebir (2015). The present resultabout can be produced yes or no showed that was hundred percentages it can be, this in relevant to Alsarrage (2012) . The present result with regard to national economy products enter circle yes or no showedthat was hundred percentage yes, thisinilluminated with Marieke (2005). The study result about is there obstipatedmarketing showedthat 76% were no obstipatedmarketing was highest 76%there, thisin accordance with Douria (2005).

5.2. Conclusion

This study was conducted in Khartoum state comprising different ecological regions varying greatly in vegetation. All the colonies were manipulated at 12 day interval for 8 month, measuring different parameter in clouding amount of bread reared,pollen collected and stored, honey production , pests , disease ,wax work and prances the queen .

The results obtained showed that the three season in open brood statistical no significant differences were found between the *acacia Nilatica* and *Cucumismelo* and *Helianthus* two seasons.

The pollen collection and storage as three season *AcicaNilatica*, *Cucumismelo* and Helianthus particularly during autumn (august – October) and winter (November –February) statistical significant correlationwere found between the three season in sold brood and pollen grains collocation.

The present study showed that the major pests were the wax moth *Gallerismellonella*L., small black Ants and Horrent .Moreover, pesticides spraying that affect the life of bees.

This study has demonstrated the effective chromatographic separation of honey sample sugars using a PerkinElmer Altus HPLC System with RI detection. The results exhibited very good retention time repeatability as well as excellent linearity over the tested concentration ranges, this work focused on the sugar analysis of experience three sample honey (*acaciaNilatica* , *Cucumismelo* and *Helianthus*), identifying the particular analysis contained in each of the honey samples, as well as comparing the sugar profiles, both chromatographically and quantitatively.The present about survey and evaluation important for successful aimed study of Khartoum State area for beekeeper lasted questionnaire for 8 successive months from Augusts 2017 to April

2018.The mains aimed was Provide baseline information of socio-economic status of mobile beekeepers Sudan due to lack of information in this field

Recommendations

The following recommendation are suggested

- Based on the findings of this research; it is recommended that the authority concerned should invest more fund and encourage the farmers generally on bees farming,
- Traditional beekeepers should be educated on the modern beekeeping and management.
- Technology honey production and processing should be modernized. One of the problems of beekeepers products traditional; so this sector must find interest by the state, this is, in order to have enough access and available to the honey production for tremendous harvest of the honey and its by-products, for provision of quick and safe supply of its nutritional values and health benefits' as well as the Gross Domestic Products (GDP) and income.
- The bees should be protected from harmful pesticides while they are in the field.
- It is recommended to that unite the weak colonies to from strong colonies for obtaining high rates of stored pollen and brood production high yield of honey.

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استبيان يوضح التقييم الاقتصادي لتربية النحل الكرنيولي للنحاله المتنقله بولايه الخرطوم

1- نوع المشروع :-
قطاع حكومي ☐ قطاع خاص ☐

2- مستوي التعليم :-
امي ☐ اساس ☐ ثانوي ☐ جامعي ☐ فوق الجامعي ☐

3- تاريخ انشاء المنحل :-
اقل من خمس سنوات ☐ 5-10 سنه ☐ اكثر من 10سنه ☐

4- نوع المنحل :-
نحل سوداني ☐ نحلي كرنيولي ☐ سوداني كرنيولي ☐ اخري ☐

5- مصدر طوائف النحل :-
استيراد ☐ تسكين ☐ شراء ☐

6- المعدات استيراد ام صناع محلية :-
استيراد ☐ تصنيع ☐

7- اذا كانت الاجابة استيراد :-
لاتوجد صناعه محليه ☐ الجوده عاليه ☐ اخري ☐

8- اذا كانت الاجابة محلية :-
متوفره ☐ غير مكلفه ☐ اخري ☐

9- عدد خلايا النحل الكرنيولي بالمنحل :-
اقل من 500 خليه ☐ 500-1000 خليه ☐ اكثر من 1000 خليه ☐

10- عمر النحل الكرنيولي بالمنحل :-
سنه ☐ سنتين ☐ اكثر من سنتين ☐ اخري ☐

11- نسبة المفقود من الخلايا في كل موسم :-
اقل من 5% ☐ 5-10% ☐ اكثر من 10% ☐

12- اسباب فقدان النحل الكرنيولي :-
ضم الخلايا الضعيفه ☐ الاهمال من الناحيه الفنيه ☐ الافات والامراض ☐
اخري اذكره ☐

13- ايهما تفضل تربية النحل السوداني ام الكرنيولي :-
سوداني ☐ كرنيولي ☐ اخري ☐

14- اذا كانت الاجابة بتربيه النحل الكرنيولي :-
سهوله التعامل ☐ الانتاجيه عاليه ☐ اخري ☐

15- اذا كانت الاجابه بتربية النحل السوداني :-
النحل السوداني شرس ☐ غير مكلف ☐ اخري ☐

16- نوع التربية :-

حديثه ☐ تقليديه ☐ تقليديه حديثه ☐

17- اذا كانت تقليدية :-

سهله ☐ غير مكلفه ☐ الانتاجيه عاليه ☐ اخري ☐

18- اذا كانت حديثة :-

نسبه المخاطره ☐ قليله مكلفه ☐ الانتاجيه عاليه ☐ اخري ☐

19- هل يوجد مع تربية النحل نشاط اخر :-

نعم ☐ لا ☐

20- اذا كان يوجد نشاط اخر :-

عدم وجود نحل في فتره معينه ☐ ضعف الازهار ☐ اخري ☐

21- هل لديك عمال في المنحل :-

نعم ☐ لا ☐

22- اذا كانت الاجابة نعم هل الاسباب :-

حجم العمل ☐ مساحه النحل ☐ اخري ☐

23- عدد العماله في المنحل :-

صغير ☐ متوسطه ☐ كبيره ☐

24- نوع العمال في المنحل :-

موسميه ☐ دائمه ☐

25- نوع العمال في المنحل من خارج منطقة المشروع :-

توفر العمال ☐ مؤهله ☐ توفر مال ☐ اخري ☐

26- نوع العمال في المنحل من داخل منطقة المشروع :-

توفر العمال ☐ رخيصه ☐ مؤهله ☐ اخري ☐

27- هل لديك عمالة موسمية :-

نعم ☐ لا ☐

28- اذا كانتع الاجابة نعم :-

كثره المنتجات ☐ العمل في المنحل شاق ☐ تحتاج الي جهد متزايد العمل ☐

اخري ☐

29- هل تلقيت دورات تدريبية في مجال النحل انت او من يقوم بالاشراف علي النحل :-

نعم ☐ لا ☐

30- اذا كانت الاجابة نعم :-

لزياده المعلومات ☐ لمواكبه التطور في المجال ☐ اخري ☐

31- عدد الدورات التدريبية في مجال تربية النحل :-

واحده ☐ اثنين ☐ اكثر ☐

32- اذكر الجهه المدربة :-

قطاع حكومي ☐ قطاع خاص ☐ منظمات ☐

33- العمال داخل المنحل او:-

مهره ☐ غير مهره ☐

34- هل تطلب نوع معين من التدريب والتاهيل للعمال :-

نعم ☐ لا ☐

35- اذا كانت الاجابة نعم :-

لزياده الانتاجيه ☐ لمكافحه الامراض والافات ☐ اخري ☐

36- نوع البيئة النباتية التي تعتمد عليها :-

غابات ☐ قطاع مروي ☐ اخري ☐

37- متوسط الانتاجية للموسم الواحد بالطن او بالكجم من العسل :-

طن ☐ كليو جرام ☐

38- المنتجات الاخري من النحل :-

شمع ☐ حبوب لقاح ☐ بروبوليس ☐ غذا ملكات ☐

39- هل تستخدم التغذية الصناعية نعم لا :-

اذا كانت الاجابة نعم :-

تغذيه بمحلول سكر+حبوب لقاح ☐ تغذيه بتصفيه العسل ☐

اخري اذكرها ☐

40- فترة التغذية الصناعية بين نهاية كل موسم الانتاج وبداية موسم الازهار الجديد :-

اقل من اسبوع ☐ اسبوع –اسبوعين ☐ اكثر ☐ اخري ☐

41- متوسط تكلفة التغذية الصناعية ل10 خلايا لكل فترة :-

50ج ☐ 100-50 ☐ 150-100 ☐ اكثر ☐

42- اثر التغذية صناعية علي النحل ايجابية ام سلبية :-

ايجابيه ☐ سلبيه ☐

43- اذا كانت الاجابة سلبية :-

زياده الافات ☐ ضعف الملكه ☐ هروب النحل ☐ اخري ☐

44- اذا هناك افات ماهي :-

نعم ☐ لا ☐

45- تكلفة مكافحة الافات :-

مكلفه ☐ غير مكلفه ☐

46- اذا كانت مكلفة :-

250ج ☐ 500-250ج ☐ 750-500ج ☐ اكثر اذكر ☐

47- هل هناك امراض :-

نعم ☐ لا ☐

معوقات تربيه النحل :-

لايجد الاهتمام الكافي من قبل الدوله ☐ الرسوم الحكوميه المفروضه ☐

اخر ازكرها ☐

48- التسويق :-

محلي ☐ تصدير خارجي ☐

49- صعوبات التسويق:-

كثره الغش ☐ المنتج غير معروف خارجيا ☐

المنتج لايجد الاهتمام الكافي من قبل الدوله ☐

50- المنتجات الاكثر مبيعا في السوق المحلي :-

العسل ☐ الشمع ☐ غذاء الملكات ☐ سم النحل ☐

اخري اذكرها ☐

51- المنتجات الاكثر رغبه في السوق الخارجي:-

العسل ☐ الشمع ☐ غذا الملكات ☐ اخري اذكرها ☐

52- هل يمكن انتاجها بصوره متوفره :-

نعم ☐ لا ☐

53- اذا كانت الاجابه بلالا اذكر المعوقات التي تواجه انتاجها :-

عدم وجود التدريب والتاهيل الكافي ☐ عدم توفر البيئه المناسبه ☐

اخري اذكره ☐

54- هل يمكن ان تدخل منتجات النحل في دائره الاقتصاد القومي :-

نعم ☐ لا ☐

55- اذا كانت الاجابه بنعم اذكر المعوقات:-

الانتاج غير متوفر ☐ لاتوجد وسائل تسويق متطوره ☐ التخزين والتعبئه ☐

اخري اذكره ☐