CRITICAL ASSESSMENT OF THE BAIT–TYPE, HIVE–TYPE AND HARVESTING–TIME SUITABLE FOR BEEKEEPING IN THE MIDDLE–BELT OF NIGERIA

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Abstract

Beekeeping is a viable venture that could be a source of valuable foods, pharmaceuticals and livelihood. These economic values have prompted exploitative studies in some parts of Nigeria, elsewhere in Africa and even beyond. Yet, there seems to be little or no scientific documentations on bait, hive and harvesting time in beekeeping within the middle belt zone hence the present study. The aim was to identify the most suitable practices in beekeeping and to achieve this, melted bee wax was imported from Israel while honey was procured in Nigeria. These were used as baits in sixty beehives of two different kinds at three different locations. Following colonization of some of these hives the honey was harvested at 4, 5 and 6 months intervals. It was discovered from the results that only the non–baited (13.3 %) and Israeli melted bee wax baited beehives (33.3 %) were colonized. Similarly, it was observed that only Kenyan top bar was absolutely (0.0 %) not colonized in any of the locations used. More interestingly, it was observed that the longer the colonization period, the higher the honey yield per hive. This was demonstrated in 4 months with maximum yield of 4 ltrs and 6 months with honey yield of 12 ltrs. Consequently, it will be more economically viable not to use baits at all, adopt Langstroth beehive type and harvest colonized hive twice per annum.

***Keywords**: Bait, beehive, bee wax, comb harvesting, honey.*

INTRODUCTION

According to Cooper (1990), beekeeping and utilization of the products have been documented since 15,000 years ago as cave men inscribed bee pictures and illustration of honey collection on cave walls. For instance in Egypt, mummies were reported to be embalmed and stored in honey–based medium. Also, it was stated that Greeks and Romans were so familiar with honey bees that they used poisoned honey to defeat some enemies in an encounter. In fact, most early civilizations considered honey to be the food of gods but, athletes believe it gives extra strength and endurance. Above all, the Great Aristotle documented volumes on bees and their products that are useful to mankind.

As cited in Ibok (1986), Reverend Langstroth invented comb foundation in 1857 and centrifugal honey extractor in 1873. Before this time, honey production techniques were so crude that the bees, hives and combs were destroyed during harvesting and the honey so obtained was often contaminated with foreign materials. The natural home for wild honey bee colony is a hollow tree, log or cave but with the advent of modern civilization, domestication of bees which is distinct from the usual honey hunting was introduced in Nigeria as a non–timber forest product (Ogunnika & Kayode, 2001). Nevertheless, more remarkable practice was recorded in farms and forests in 1942 and the system of beekeeping was in cylindrical dug–out wood and the long straw–covered hives in Kaduna, Katsina, Sokoto, Kano, Borno, Bauchi and Niger States. Earthenware and cooking pots were observed to be commonly used in Plateau and hollow tank in southwestern Nigeria (Adekola *et al*., 2003; NARP, 1995). Generally, it was reported that early beekeepers used hollow logs, straws, grass roofing, baskets and clay cylinders which are destroyed during harvesting (NARP, 1995). But today, technology in beekeeping has advanced so much that modern hive are used in keeping bees at desired locations and the honey produced could be whirled out of the combs and returned intact to the hive for refilling by the bees for subsequent harvesting (Wilson, 2006; Hill, 2006). A typical modern hive should contain brood chamber, queen excluder, honey supper, top bars and hive covers. In order to attract bees to a modern hive for colonization, Cooper (1990) suggested the use of bee wax, propolis and honey as baits. Meanwhile, use of several other baits have been reported such as cassava flour, locust bean, lime and some scented herbs (NAERLS, 2011; Okwee–Acai *et al*., 2010; Ande *et al*., 2008a,b; NARP, 1995). These options become more suitable due to availability in the localities coupled with the cost of modern baits like bee wax

which Cooper (1990) stated could cost as much as $80 US per pack.

The primary product of beekeeping is honey but bee wax, propolis, royal jelly, pollen and bee venom have been discovered to be other invaluable products (Gani, 2008). In order to obtain all these products, careful harvesting by experienced beekeeper or personnel is paramount to prevent destruction of the hives and to avoid desertion of the colonized hive. A well managed colonized hive could last for several years and harvested at every 4 – 5 mths with an average return of about $200 US from the honey and $3 US from the bee wax per year (Hill, 2006; Ogundele *et al*., 2004; Usman & Adesope, 2003). According to NAERLS (2011), beekeeping could be practiced throughout the year and harvesting could be done every four months with average honey yield of 12 – 15 ltrs per annum, depending on the location and strength of the colony.

Even with these observations, there seems to be little or no documentations on the proper bait, hive and harvesting time in beekeeping in Nigeria. Hence, this study was conducted to assess the bait–type, hive–type and harvesting interval suitable for honey production in the middle belt of Nigeria.

MATERIALS AND METHODS

Study Site and Climatic Conditions

The study was conducted in the Campus of College of Agriculture, Lafia (COAL) Nigeria. Lafia lies on latitude 8º 35'N, longitude 8º 32'E, altitude 181.53 m above sea level with mean temperature of 34ºC, relative humidity of 40 – 86 % and average day light of 9 – 12 h (NIMET, 2009). The vegetation pattern consists of different species of trees, shrubs and grasses which could produce flowers at different seasons of the year and there are two streams at the borders of the Campus which flow throughout the year.

Experimental Design

The honey, Langstroth and Kenyan top bar hive were procured from Niger State, Nigeria while the melted bee wax was imported from Israel. The bee wax bait–type and honey bait–type were conveniently referred to in this study as Israeli melted bee wax and Nigerian honey respectively.

Study I

A total of sixty hives in four treatments with fifteen hives comprising both Langstroth and Kenyan top bar types were used per treatment. Treatment 1 which served as the control was not baited but treatments 2, 3 and 4 were baited with Israeli melted bee wax, Nigerian honey as well as a mixture of the Israeli melted bee wax and the Nigerian honey in that order. The numbers of hives colonized were recorded.

Study II

Three stations namely: Permanent Site, COAL Apiary Site and Wildlife Domestication Unit of the Faculty of Agriculture, Nasarawa State University Keffi (Shabu–Lafia Campus), all within the premises of the College of Agriculture Lafia were selected for the study. A total of sixty beehives in the three stations with twenty beehives of ten Langstroth and ten Kenyan top bar hive–type were alternated in a linear arrangement at 1 x 1 ft apart as recommended by Ibok (1986). All the hives were baited with only the Israeli melted bee wax to minimize extraneous errors and the numbers of hives colonized and the hive–type colonized were recorded.

Study III

After colonization of some hives in study II, harvesting of the combs was done at regular intervals of 4, 5 and 6 mths. In each case, smoke from faggot was used at night by specialized personnel fully equipped with the kits recommended by Ibok (1986) to avoid bee stings. Care was taken at every point in time not to disturb the queens as well as the colony activities. After each harvest, the combs were collected in a plastic container and the honey was extracted by a trained personnel. The honey yield was measured in litres while the bee wax was weighed in kilogram using table scale (Five Goats Brand®).

Data Collection and Analysis

The values obtained for number of hives colonized by wild honey bees, total honey yield harvested as well as the weight of bee wax were subjected to simple descriptive statistics as prescribed by Adesoye (2006).

RESULTS AND DISCUSSION

Importance of bait–type in beekeeping

A total of twelve beehives representing 20 % were colonized out of the sixty used in the study. Those baited with Israeli melted bee wax (Treatment 2) and a mixture of both Israeli melted bee wax and Nigerian honey (Treatment 4) had the highest values of five colonized hives each, representing 33.3 % of the fifteen per treatment. This was slightly followed by Treatment 1(control) with only two hives colonized, representing 13.3 % of the fifteen. Whereas, the hives baited with Nigerian honey (Treatment 3) was absolutely (0.0 %) not colonized by honey bees during the study period. This observation was similar to inefficacy of some bait reported by Ande *et al*. (2008a). It was interesting to observe that immediately after baiting, all the hives in Treatments 1 – 4, were visited by wild bees which ended up empting the baits in those that were eventually not colonized. This observation could be purely due to

the number of queens in the colonies that visited all the hives and probably due to the number of colonies and the population size of each colony which perhaps led Ibok (1986) to report that several colonies with about 20, 000 – 80, 000 bee population as well as a two–queen–colony is stronger than a single–queen–arrangement with low bee population.

There is a clear indication from the present study that well designed beehive situated in a conducive environment, may not require baits before colonization. This further lent credence to the speculation of Falade (2011) that honey production requires appropriate conditions for optimum yield. More importantly, it was demonstrated that pure honey may not be appropriate as bait in domestication of honey bees in the study area.

Influence of hive–type on honey bee domestication

A total of five hives representing 50 % each were colonized at the Permanent Site and COAL Apiary Site out of the ten hives each of Langstroth and Kenyan top bar (i.e. 20 per treatment). Whereas, only two hives representing 20 % were colonized at the Wildlife Domestication Unit of the Faculty of Agriculture, Nasarawa State University Keffi (Shabu–Lafia Campus). In any case, it was discovered that Kenyan top bar hive–type was absolutely (0.0 %) not colonized rather, only Langstroth hive–type was colonized by wild honey bees in each study location. This discovery disagreed with the report of Ande *et al.* (2008b) that Langstroth hive–type performed very poorly in their experiment. Also, it contradicted the observation of Taylor (1978) that Kenyan top bar had the highest colonization rate and speculated it was the best hive for African honey bees. Similarly, the present finding was against the observations reported by Aidoo & Paxton (1991) as well as Adejare (1989) who rated Kenyan top bar hive–type in separate studies above other hive types including Langstroth hive–type even as the best in Ghana.

The observation in the present study could be possibly due to the differences in pattern of brood chamber, frame and hive covers between Langstroth and Kenyan top bar. Also, it could be solely attributed to choice of the swarming colony which Ibok (1986) stated that settling behaviour of honey bees in a hive is a unanimous acceptance by all members of the colony and probably due to non–availability of swarming bees in the area as reported by Ande *et al.* (2008b). Therefore, this observation corroborated the report of Okwee–Acai *et al.* (2010) that hive type significantly influenced bee colony establishment.

Interestingly, it was observed that some hives in the three stations used in the present study were colonized irrespective of the disparity within the study locations. This implied that the climatic conditions in the study sites were suitable thus further strengthened the speculations by Falade (2011) that honey production requires appropriate locations for optimum yield. Consequently, beekeeping is possible and if managed properly could be a veritable tool in food security as described by Sanchez & Leakey (1997) as well as Cooper (1990). However, care should be taken in the choice of beehive type as reflected in the present study in which Kenyan top bar was not colonized throughout the study period.

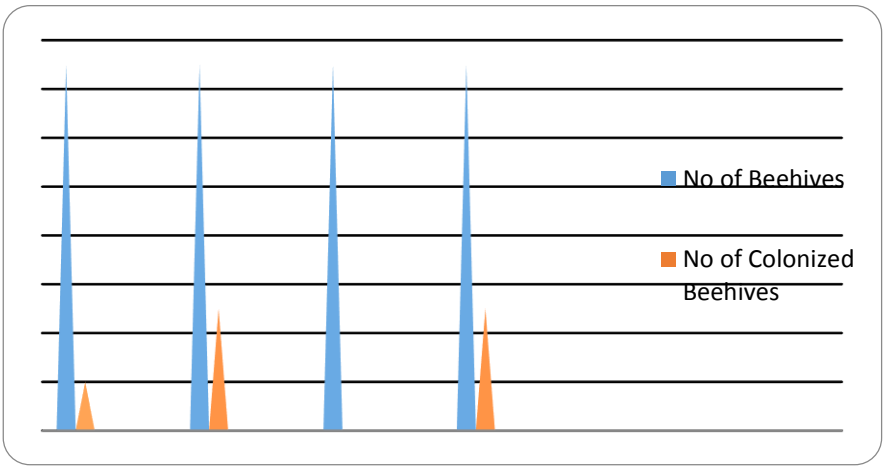

Fig. 1: Effect of bait–type on hive colonization

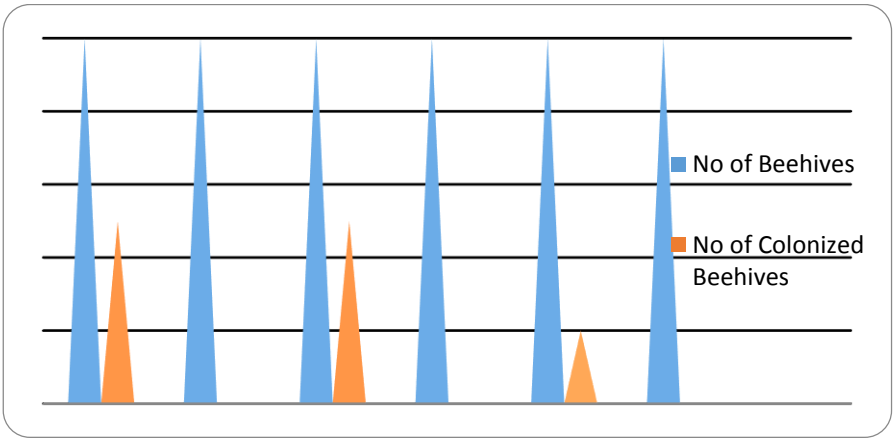

Fig. 2: Influence of hive–type on beekeeping

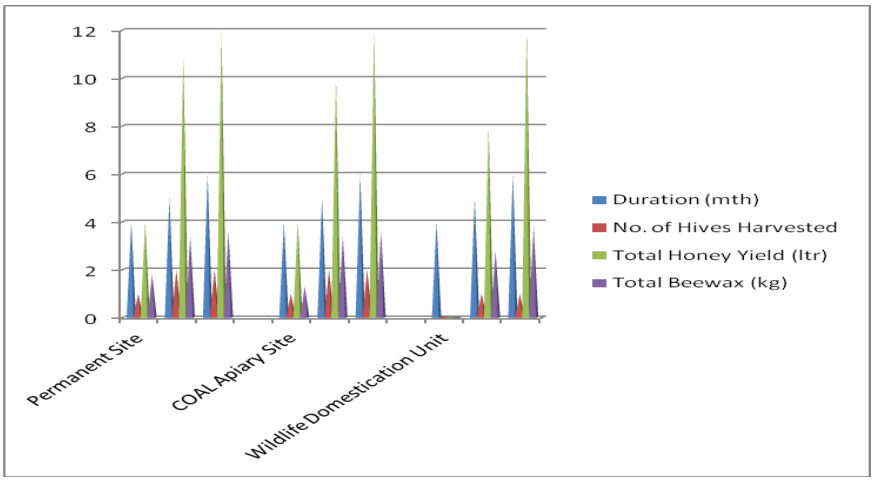

Fig. 3: Impact of colonization duration on honey yield

Impact of time factor on honey yield

At 4 mths of colonization, it was discovered that maximum yield of 4 ltrs were extracted from the harvested combs in a hive each at the Permanent Site and COAL Apiary Site. While at the Wildlife Domestication Unit, Nasarawa State University Keffi (Shabu–Lafia Campus), harvesting at 4 mths was skipped. Again at 5 and 6 mths, two hives each were harvested at the Permanent Site and COAL Apiary Site, where an average of 5 – 6 ltrs (i.e. total yield of 10 – 12 ltrs per two hives) were the honey yield. Meanwhile, by the 5th and 6th mth of colonization at the Wildlife Domestication Unit, Nasarawa State University Keffi (Shabu–Lafia Campus), 8 ltrs and 12 ltrs respectively were harvested.

The observed highest honey yield harvested at the Wildlife Domestication Unit, Nasarawa State University Keffi (Shabu–Lafia Campus), could be largely due to the location where the hedges might have influenced the ambient temperature which NAERLS (2011) reported could influence total honey yield. More so, it could be as a result of season which Falade (2011) speculated will determine abundant or little nectar flow from flowering plants necessary for honey synthesis.

In this study, there was no synchronization of hive colonization thus each harvest was done purely based on when the hives were colonized. In any case, all the harvesting exercise was performed in the months of February – November, which contradicted July – January that Ibok (1986) described as the peak periods of nectar flow from flowers in the guinea savanna zone of Nigeria. This could perhaps be the cause of the seemingly low honey yield (4 – 6 ltrs) recorded in the present study against 12 ltrs per hive reported by Ibok (1986). Also, it could be solely due to the relatively short time of colonization before harvest. This however disagreed with the report of NAERLS (2011) that harvesting could be done every month with appreciable honey yield especially when artificial wax foundation is used and depending on the location as well as the strength of the colony. Meanwhile, 8 – 12 ltrs of total honey yield from the Wildlife Domestication Unit, Nasarawa State University Keffi (Shabu–Lafia Campus), were close to the optimal values reported by Ibok (1986). Above all, in each harvest the bee wax weighed approximately 2.0 kg which was slightly greater than 1.4 kg reported by Usman & Adesope (2003). As a result, harvesting of honey could be done at 6 mths interval to obtain optimal yield. More importantly, it will be more economical as the activities in the hive will not be disrupted too often which may lead to desertion and forceful swarming.

CONCLUSION

Since honey and Kenyan top bar were apparently not suitable as bait and beehive respectively in the present study as well as the seemingly low honey yield at 4 mths and 5 mths of colonization. It could be more economical not to use bait in bee domestication process at all or to use other kinds of baits and beehives in the study area and to harvest honey twice per year to reduce disturbance of the hive for optimum yield.

REFERENCES

Adejare, S. O. (1989). Ghana: 10 years of beekeeping development, Newsletter. Beekeeping Tropical Subtropical Countries, 16: 12 – 13.

Adekola, P. J., Muraina, G. T. & Ojo, M. O. (2003). Consumption pattern of honey: A case study of Ibadan Metropolis In: Proceedings of the 11th Annual Conference of Environmental Behavioural Association of Nigeria, held in November 2003 at FUTA, Nigeria, pp. 20 – 23.

Adesoye, P. O. (2006). Practical Guide to Statistical Analysis for Scientists (A Primer edn.). Debo Prints, Ibadan, Nigeria, 189pp.

Aidoo, K. S. & Paxton, R. J. (1991). Low cost foundation. J. Beekeeping Development, 21: 4 5.

Ande, A. T., Oyerinde, A. A. & Jibril, M. N. (2008a). Comparative study of the efficacy of six different baiting materials on bee colony performance in traditional and modern hives. Advances in Biological Research, 2(1–2): 13 – 16. Accessed on: http://www.idosi.org/abr/2%281–2%29/3.pdf

Ande, A. T, Oyerinde, A. A. & Jibril, M. N. (2008b). Comparative study of the influence of hive types on bee colony establishment. International Journal of Agriculture and Biology, 10(5): 517 – 520. Accessed on: http://www.fspublishers.org/ijab/pastissues/IJABVOL_10_NO_5/9.pdf

Cooper, E. L. (1990). Agriscience Fundamentals and Applications. Delmar Publishers Inc., Albany, NY, 392pp.

Falade, L. O. (2011). Honey Production: Appropriate Factors for Optimum Yield. Monthly Technology Review Meeting, held on the 26 – 27th October 2011, organized by Nasarawa State Agricultural Development Program (NADP), Nigeria.

Gani, A. (2008). Healing power of honey In: Beekeeping and Apitherapy Research Centre. Honey Multi Ventures Publication, Ibadan, Nigeria. pp, 37 – 38.

Hill, M. (2006). The management and maintenance of colonies in honey bee. Science and Technology, Encyclopedia, Accessed on: http://www.answer.com/topic/beekeeping–1.

Ibok, H. B. (1986). Beekeeping: Digest of selected literature. Libriservice Ltd, Lagos, Nigeria, 203pp.

NAERLS, (2011). A guide to beekeeping technology for farmers. National Agricultural Extension and Research Liaison Services, Federal Ministry of Agriculture and Rural Development, Zaria, Nigeria, 28pp.

NARP (1995). Beekeeping Technology for Nigerian Farmers. Extension Bulletin No. 3, Revised, National Agricultural Research Project, Zaria, Nigeria, pp. 8 – 13.

NIMET (2009). Nigerian Metrological Agency, Synoptic Office, Lafia, Nasarawa State, Nigeria.

Ogundele, O. J. K., Adekola, P. J., Alaka, N. S. & Balogun, M. T. (2004). Managing Forestry personnel and forest resource for wealth creation. In: Proceedings of the 12th Annual Conference of Environmental Behavioural Association of Nigeria held in November 2004 at UNAAB, Nigeria. pp, 107 – 109.

Ogunnika, C. B. & Kayode, J. O. (2001). Use of non–timber forest product as food from Nigerian Forest. In: Book of Abstract 35th Annual Conference of Agricultural Society of Nigeria, 8pp.

Okwee–Acai, J., Anyanzo, T. A., Aroba, J., Vuchiri, J. K., Onzivua, T. & Okullo, P. (2010). Effects of apiary management on colonisation and colony performance of African honey bee (*Apis mellifera*) in the North–Western Agro–ecological zone of Uganda. Livestock Research for Rural Development, 22(5): 2010.

Sanchez, P. A. & Leakey, R. R. B. (1997). Land use transformation in Africa: Three determinees for a balanced food security with natural resource utilization. European Journal of Agronomy, 7: 15 – 23.

Taylor, J. E. (1978). Bibliography of Tropical Apiculture. Part II, 18pp.

Usman, J. M. & Adesope, A. A. (2003). Benefits–cost analysis of honey production in Ibadan. In: Proceedings of the 29th Annual Conference of the Forestry Association of Nigeria, held in October 2003 at UNICAL, Nigeria, 94pp.

Wilson, R. T. (2006). Current status and possibilities for improvement of traditional apiculture in sub–Saharan Africa. Livestock Research for Rural Development, 18(8): 2006.