International Journal of Research Studies in Biosciences (IJRSB)
Volume 6, Issue 7, 2018, PP 1-5
ISSN No. (Online) 2349-0365
DOI: http://dx.doi.org/10.20431/2349-0365.0607001
www.arcjournals.org

Determination of the Quantity of Pure Bees Wax Obtained from Crude Beeswax in Selected Zones of Oromia

Taye Negera[1], Demelash Zelalem[2], Tigist Lemma[2], Hana Tadesse[2], Yeshitela Eshete[2]

[1]*Holetta Apiculture Research Center*

[2]*Ethiopia Meat and Dairy Industry Development Institute*

Corresponding Author:** ***Taye Negera, *Agricultural research Institute, Holeta Bee research center, PO box 22, Holeta, Ethiopia.*

Abstract: *Oromia regional state is with high potential of honey and bees wax production and where there was dissemination of modern beekeeping potentials. The study was carried out in selected districts of west shoa and Jimma zones of Oromia regional state: such as Wolmera, Gedo,Jimma,Gera and Goma districts. The objective of the study was to determine the amount and quality of pure wax recovered from crude bees wax resources that collected from potential beekeeping practice and local honey wine making houses. Based on the existing situation of the region there are different sources of crude beeswax which are from honey wine making houses left over, old and broken combs and the residue of honey purification process were the major sources. The main source of crude beeswax that used for the processors and export companies is the crude beeswax produced and collected from the local honey wine making houses. Due to the absence of enough information on the recovered percentage of pure wax in particular when the crude beeswax resource is from honey wine making houses left over. The lack of reliable information could made a controversy to set and collect the required income tax rate from beeswax processors and exporter companies. To implement the proposed research the representative crude beeswax samples was collected across honey and beeswax potential districts of Oromia regional state the collected samples from 17 sites of the four regions were bulked into 6 samples by homogenization and the samples was extracted by using two techniques which are manual and mechanical methods. The extracted pure bees wax samples were tested to investigate chemical quality parameters and all of the samples was met the national and international quality standards, except the total volatile matter content that investigated maximum than the standards .The percentage of pure wax recovered from 5 kg of crude beeswax from local honey wine making houses left over was varied from 31.8 to 32.8.0% with mean of 32.2 % using manual extraction methods and similarly 18 to 32 % with mean of 24.67 % using mechanical method. The average percentage of pure wax recovered from crude wax from local honey wine houses left over by using manual and mechanical extraction method is 32.2 % and 24.67 %, respectively with the cumulative average of 28.4 %. Further studies on identification of the optimum temperature and time required in heating crude beeswax for extraction process and conducting research review to investigate the crud wax wastage due to mishandling at local producers.*

Keywords: *Beeswax, comb, Ethiopia, Extraction Oromia and Recovery*

1. INTRODUCTION

Oromia region having large share of honey production of the country, with about 41% of total country's production, the regional government disseminated considerable number of modern hives to farmers which are produced by different regional agricultural mechanization research centers and different private microenterprises in 2001/02. According to CSA, the major honey and beeswax producing regions in Ethiopia are Oromia (41%), SNNPR (22%), Amhara (21%) and Tigray (5%) however, the country is suffering from the ecological degradation of its natural resources and this means the basis for any honey production is threatened and affected. In many district of the region, beekeeping is considered as one of the income-generating activities for resource-poor farmers including women, youth and the unemployed sectors of the community (CSA, 2011).

Beeswax yield from traditional hives is 8 to 10 percent of the honey yield, compared to 0.5 to 2 percent from modern hives. The bulk of the supply of beeswax obtained as residual from tej production, a mild alcoholic beverage popular throughout Ethiopia. Beeswax mainly from "tej" brewery, which collects the wax as a by-product of "tej". The "tej" brewers either sell the crude

beeswax or semi-processed to the local beeswax collectors who supply to beeswax refiners in Addis Ababa. The beeswax processors produce the final pure beeswax suitable for export market and local markets. Currently, the annual turn-over of the apicultural industry varies between 185 and 450 million birr, of which only 5 million Birr worth beeswax exported (EEPD, 2006). According to Nuru 2010, around one tenth of the world annual beeswax production that is estimated to be around 50,000 tones. The smallholding beekeepers are the primary sources of beeswax in Ethiopia who sell the majority of crude honey to the tej brewers, hence most of marketable crude beeswax comes from them as a by-product of the beverage(EEPA , 2012). After the beverage production, the tej makers collect the crude bees wax and store it as it is in the crude form of "sefef" or partially strained form of "kisses". The sefef the partially processed keskesis collected from the tej makers. The major challenges that is attributing to the increasing adulteration of beeswax with cheap materials like animal fat in addition to the ever increasing price that draws attention of the people involved in the mischief. Currently, a kilogram of purified blocks of beeswax cost about 250-300 ETB (25-30 USD) in the local markets (Gemechis Legesse,2014). Therefore, the intention of this study was to determine the amount and quality of pure wax recovered from crude bees wax resources that collected from local honey wine making houses.

2. MATERIALS AND METHODS

This research has been conducted with the collection of representative crude beeswax samples from selected bees-wax production potential districts of Oromia. The representative samples were collected from 17 sites found in Oromia, regions which can represent the potential areas of beekeeping practices and tej making towns of these districts.

After collection of the sample it is dried and prepared through scientific way in order to make it available for processing or extraction. Homogenization and coding are among actions done before extraction processing proceed. All of the samples collected from 17 sites of the Oromia region were bulked into six samples during homogenizing process. The samples were categorized into manual and mechanical methods to examine the efficiency of two methods of extraction. Five kilogram of crude beeswax samples were used for both mechanical and manual extraction methods.

The samples were collected from the local honey wine making houses which they were prepared to sale for their clients. This sample was collected in Polytien bag size of 2 kg and grouped into fiber made sack of 50kg size. It was brought to HBRC for further preparation and extraction processes. Then the samples were grouped for manual and mechanical extraction methods.

Figure1. *Manual and mechanical extraction method device*

2.1. Chemical Quality Parameters of the Collected Samples

The melting point of the extracted beeswax samples were varied from 64.48^{o}C to 64.65^{o}C with mean of 64.5^{o}C (Table 3). In this test out of six samples all of them met within acceptable range of beeswax melting point (61-66^{o}C). The Saponification cloud point test results of collected samples were varied from 93 to 94.42 with mean of 93.6 (Table 3). Out of six samples all of them indicated a saponification cloud point with the acceptable range 80-105. The acid values of the tested samples were varied from 20.2 -20.86 with mean value of 20.5. Out of six samples all of them show the acid values with the acceptable range 17-24. The ester values of the test results were varied from 72.79 to

73.5 with mean of 73.1 (Table 3). In these test all samples met the standard of ester values, which range 70-80. The total volatile matter of the tested samples were varied from 1.19-1.98 with mean value of 1.51 out of six samples all samples fail to meet the standard requirement which is 0.75 is the max value (table3).The ash values of the test results were varied from 0.051-0.064 with mean of 0.05 (Table 3). In these test all of the six samples met the standard ash values, which is 0.20 max requirements. All of the extracted pure bees wax samples and tested to investigate chemical quality parameters was met the national and international quality standards, except the total volatile matter that investigated 1.194 and 1.51 which is maximum than the required standards 0.75 (Table 3).

2.2. Sampling Method

The sample collection was carried out for twenty five consecutive days. The representative samples were taken up from the bulk crude beeswax products that were found at the local honey wine making house storages by using purposive sampling method. For the study six crude beeswax samples with an average weight of 1.2 kg is collected from different local honey wine making houses in Oromia regional state. During sample collection further information's on the bees-wax production, handling, market and other relevant problems were identified.

2.3. Data Management and Statically Analysis

Descriptive statistics were used to analyses the sample and to compare the mean of the samples.

3. RESULT AND DISCUSSION

During the study period the samples of crude beeswax was collected from different local honey wine making houses (tej) and the prices of the crude wax at the local market of the study areas were varied from place to place. The variation ranges from Birr 55.0 /kg to Birr 65.0 /kg of crude beeswax with mean of Birr 60/kg. The reasons for the rising of the price could be due to the recent involvement of cooperatives and unions in purchasing of crude bees wax, the initiation of some investors to involve in collecting and processing of crude bees wax into a pure wax and involvement illegal traders.

The quality of crude beeswax resources that produced at local wine making houses was vary from place to place and most of the crude beeswax were identified as low quality this is due to an appropriate post harvest management and handling practice. The percentage of pure wax obtained from 5kg of crude beeswax was varied from 31.8 to 32.8% with mean of 32.2% using manual extraction method, which depends on the quality of crude beeswax (table1). Using mechanical method of extraction the percentage of pure wax recovered from 5 kg crude beeswax was also varied from 18 to 32 % with mean of 24.67 % it depends on the efficiency of the device used for extraction, the quality of crude beeswax and the amount of crude beeswax used for per extraction (table2). The cumulative average percentage of pure bees wax recovered from crude bees wax by using manual and mechanical method of extraction was 28.4%.

Table1. *Pure wax recovery from crude beeswax with manual extraction method*

No	Region	Sample code	Initial wt / kg	Final wt/kg
1	Oromia	Sample 01	5	1.59
2	Oromia	Sample 02	5	1.60
3	Oromia	Sample 03	5	1.64
Region average				**1.61**

Pure beeswax recovery percentage variation were identified between the mechanical and manual methods of crude beeswax extraction, the significance of the variation is analyzed independently.

Table2. *Pure wax recovery from crude beeswax with Mechanical (device) wax extraction method*

No	Region	Sample code	Initial wt / kg	Final wt/kg
1	Oromia	Sample 01	5	0.9
2	Oromia	Sample 02	5	1.60
3	Oromia	Sample 03	5	1.20
	Region average			**1.2**

3.1. Quality Parameter Analysis of the Extracted Bees Wax

The purified bees wax samples was investigated for chemical quality parameters of melting point, saponification cloud point, acid value, ash value and total volatile matter. The analyses were conducted based on the protocol of national and international standards at Ethiopian Conformity Assessment Enterprise laboratory and the tested result is characterized.

Table3. *Comparison quality with in test result mean and standard requirement*

Ser.no	Parameters	Test result mean	Standard requirement
1	Melting point	64.5	61-66
2	Refractive index at 75	1.44	1.44-1.45
3	Ash% by mass	0.05	0.20MAX
4	Total volatile matter %by mass	1.58	0.75 MAX
5	ACID value	20.5	17-24
6	Sopnification value	93.6	85-105
7	Easter value	73.1	70-80
8	Fats and fatty acids	TO PASS THE TEST	PASS

**All the samples tested at Ethiopia conformity assessment Enterprise (ECAE)*

Table4. *Comparison quality with in test result mean and standard requirement/manual extraction*

Ser.no	Parameters	Test result mean	Standard requirement
1	Melting point	64.65	61-66
2	Refractive index at75	1.44	1.44-1.45
3	Ash% by mass	0.051	0.20MAX
4	Total volatile matte r %by mass	1.194	0.75 MAX
5	ACID value	20.287	17-24
6	Sopnification value	93.102	85-105
7	Easter value	72.78	70-80
8	Fats and fatty acids	TO PASS THE TEST	PASS

Table5. *Comparison quality with in test result mean and standard requirement mechanical extraction*

Se.no	Parameters	Test result mean	Standard requirement
1	Melting point	64.48	61-66
2	Refractive index at75	1.441	1.44-1.45
3	Ash% by mass	0.064	0.20MAX
4	Total volatile matte r %by mass	1.98	0.75 MAX
5	Acid value	20.8	17-24
6	Sopnification value	94.42	85-105
7	Easter value	73.5	70-80
8	Fats and fatty acids	TO PASS THE TEST	PASS

4. CONCLUSION

CONCLUSION AND RECOMMENDATIONS

Small to large scale processing of crude honey and marketing of pure honey and beeswax seems very attractive business. So beekeepers should be encouraged to strain their honey to sell the honey and beeswax separately and assisted to link them market outlets. The initiation in collecting, storing and selling of honey by cooperatives and unions is advantageous for the farmers and also for honey processors in which they may serve as agents for honey processors, to sell the honey in bulk. The efficiency of traditional beeswax rendering method is very low and contributed for lose of large amount of beeswax annually, in this regard it is paramount important to seek low cost and efficient crude beeswax refining technologies that can be affordable to farmers cooperatives, tej makers and small scale beeswax processors.

Processing and marketing of bees-wax is an attractive business. So processer and exporters should be encouraged to sell the bees-wax and assisted to link them into market outlets. The initiation in collecting, processing storing and selling of bees-wax by export company is advantageous for the local honey wine making business and also for beeswax processors in which they may serve as agents for bees-wax processors, to sell the wax in bulk. The manual crude wax extraction method is time consuming and labor intensive but the amount of pure wax yield recovered from the crude wax is better than the mechanical crude wax extraction method and the mechanical wax extraction method is less time consuming, low labor intensive and pure wax yield recovery when compared to manual extraction method. Which contributed for loss of large amount of beeswax annually, in this regard it is paramount important to seek low cost and efficient crude beeswax refining technologies that can be affordable to farmers cooperatives, local honey wine makers and small scale beeswax processors.

According to this study the percentage of pure wax obtained from 5kg crude beeswax was varied from 31.8 to 32.8 % with mean of 32.2 % and the percentage of pure wax obtained from 5kg sefef was varied from 18 to 32 % with mean of 24.67 % using manual and mechanical method of extraction respectively. The variations of yield obtain between manual and mechanical wax extraction methods were significant. The presence of significant variation in wax yield between manual and mechanical method is due to the amount of residue, other foreign materials and handling of crude beeswax and of extraction, efficiency of the device, the operation method and the amount of crude beeswax used per extraction .The beeswax samples collected and tested for relevant beeswax quality properties met the requirements of national and international beeswax standards. However, the study revealed that all samples failed to meet total volatile matter of the national and international standard, which mainly due to inappropriate heating of the crude beeswax in high temperature. Research review to investigate the crud wax wastage due to mishandling in particular at local honey wine making houses.

ACKNOWLEDGEMENTS

The authors like to express their deep acknowledgment to the **Ethiopia Meat and Dairy Industry Development Institute** and Holeta Bee Research Center, for the material, logistics and financial support and district Agricultural offices for their assistance during data collection. Lastly they would like also to express their thanks to honey wine maker in the study area for their willing to be interviewed and giving us all the valuable information.

REFERENCES

[1] Demisew W (2016) Beekeeping in Ethiopia Country Situation Paper Presented to 5th ApiExpo Africa 2016 Held in Kigali, Rwanda from 21st to 26th, Held in Kigali, Rwanda p. 1-32.2.

[2] FAO (2005) Statistical yearbook, FAOSAT.

[3] EEPA (2010) Ethiopian export data. Ethiopian Export Promotion Agency. Addis Ababa, Ethiopia.

[4] CSA (2012). Central statistical agency, Addis Ababa ,Ethiopia.

[5] CSA, 2011. Agricultural sample survey 2010/11, 2: 15. Edessa Negra, 2005. Survey on honey bee production. Statistical bulletin 505. Report on livestock and system in west Shoa zone proceeding of the Livestock characteristics (prevent peasant holdings), Ethiopian beekeeper association. Addis Ababa, February 2011.21 [

[6] ECRA(2010).Ethiopian Custom and Revenue Authority Addis Ababa, Ethiopia

[7] EEPA (2012) Ethiopian export data. Ethiopian Export Promotion Agency. Addis Ababa, Ethiopia.

[8] EEPD (Ethiopia Export Promotion Department) (2006) Exports of honey and beeswax: Draft report. EEPD, Ministry of Trade and Industry, Addis Ababa, Ethiopia, pp. 21-22.

[9] Gemechis Legesse (2014). Beeswax Production and Marketing in Ethiopia: Challenges in Value Chain. *Agriculture,Forestry and Fisheries*. Vol. 3, No. 6, 2014, pp. 447-451.

[10] ITC (International Trade Center) (2003) Honey: A study of major markets. International Trade Center, UNCTAD/GATT, Geneva.

[11] Nuru, A. and Eddessa, N. (2006). Profitability of processing crude honey. Pp 79-84. Proceedings of 13th Annual Conference of Ethiopian Society of Animal production (ESAP). August 25-27, 2004. Addis Ababa, Ethiopia 244pp

[12] Nuru, Adgaba (2000). Physical and chemical properties of Ethiopian bees-wax and detection of its adulteration .Ethiopian J, Ani.Pro7;39-48.

[13] SPDGCHIE,(2015), Strategic Plan to Develop Globally Competitive honey Industry in Addis Ababa, Ethiopia.

Citation: *T. Negera et al., "Determination of the Quantity of Pure Bees Wax Obtained from Crude Beeswax in Selected Zones of Oromia", International Journal of Research Studies in Biosciences (IJRSB), vol. 6, no. 7, pp. 1-5, 2018. http://dx.doi.org/10.20431/2349-0365.0607001*

Copyright: *© 2018 Authors. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*