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Assessment of Major Honey Bee Forage Resources and Floral Calendar Establishment in Selected Districts of Arsi Zone, Oromia Region State, Ethiopia

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Abstract
The study was conducted from 2015 to 2017 G.C. with the objective of identifying and documenting honey bee forage plant resource, establishing flowering calendar and recommending the necessary seasonal colony management practices in selected districts of Arsi zone. Semi-structured questionnaire tool was used to collect data. Ninety beekeepers were selected and involved in data collection. Traditional, transitional and modern bee hives were used for honey production. The overall mean of colony owned per household in the current study areas was found to be 5.2±5.2. Honey production was conducted during two seasons namely: major and minor seasons. The mean of honey yield per traditional, transitional and modern hive was 10.8±5.9kg, 19.8±17.3kg and 33.2±48.9kg, respectively. 61.1% of the respondents harvest honey two times a year, whereas 34.5% of them harvest honey once a year and 4.4% of respondents three times a year. Honeybee was found to be in critical shortage of forage during months ranging from December to August. A total of 98 plant floras including trees, shrubs, herbs, cultivated crops and animal feeds and grasses were identified in the current study areas. G*uizotia scabra, equiliptus globules* and *vernonia species* were the most frequently identified plant species. The knowledge in the identification of honey bee flora and their flowering time has therefore paramount importance in assisting beekeepers to establish appropriate colony management calendar and honey flow season. Further detail studies focusing on bee flora should be conducted and awareness creation of experts and farmers on seasonal management of beehives through training is required.
Keywords: honey bee, bee flora, flowering time, Arsi, Ethiopia
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1. Introduction

Beekeeping is a promising non-farm agricultural activity, which has a great contribution in poverty reduction, sustainable development, conservation of natural resources creating and creating better employment opportunities (Gidey and Mokenen, 2010). Apiculture has a substantial role in generating and diversifying the income, particularly for small landholders and landless youths' community of Ethiopian (Tadesse, 2001). Ethiopia is endowed with diverse and unique flowering plants of 6000 to 7000 species thus making it highly suitable for large number of colonies and long practice in beekeeping (Gidey and Mekonen, 2010). The annual honey production of the country was estimated to 50,000 tons in 2018, out of which Oromia region accounts for 38% of the total production (FAOSTAT, 2020).

Beekeeping is a floral based industry and honey production entirely depends on availability of flowering plant resources (Rucker *et al*., 2002). Honeybees do not visit all plants for their nutrition; as a result, identification of the plants and assessing their abundance, their value to bees, time of blooming and flowering period have a paramount importance for practical beekeeping and in assessing the potential of an area for beekeeping as well as in planning appropriate seasonal management and effectively uses of the resources (Amssalu *et al*., 2004). Beekeepers lack a basis to undertake their beekeeping activities based on possible information on seasonal floral calendar. This would have a negative effect on practicing appropriate hive and apiary management, honeybee feeding, honey harvesting and controlling natural swarming (Haftom *et al*., 2013; Tolera and Dejene, 2014). Therefore, establishing floral calendar is a critical tool for planning various beekeeping management operations such as hive super adding and to predict the frequency and period of honey flow in a given area.

Beekeeping activity is widely practiced by the agrarian community of Arsi zone. However; bee forages of the current study is not adequately documented and their correlations with seasonal colony management calendar are not established to the required level. Therefore, the objectives of the present study are to identify and document honey bee forage plant resource, establish flowering calendar and to recommend the necessary seasonal colony management practices in selected study districts of Arsi zone.

2. Materials and Methods

2.1 Description of the study area

The study was conducted in three selected districts of Arsi zone namely: Digelu and Tijo, Dodota and Lode Hetosa. Arsi zone is situated between 6˚45'N to 8˚58'N latitude and 38˚32'E to 40˚50'E longitude (EIDP, 2002). It is among the 22 potential beekeeping zones of the Oromia regional state. All the three study districts are characterized by mixed crop-livestock production system. Beekeeping activity is commonly practiced in study areas. The mean annual temperature of the zone ranges between 20˚C - 25˚C in the low land and 10˚C - 15˚C in the central high land (NRGOBFED-RSt, 2012).

2.2 Assessment of honey bee forage resources

Well semi-structured questionnaires was developed and used for this survey and both primary and secondary data was collected from the respective study districts. Initially, general information of each animal including their kebeles, working experience on beekeeping, types of bee colony owned and colony dynamics history was recorded on the format developed for this purpose. Study sites that represent different agro-ecology were identified. Accordingly, Digelu and Tijo was selected from highland area, Dodota was from lowland and Lode Hetosa was representing midland area of the study site. Assessment of honey bee forage resources of the selected study districts was made using prepared questionnaires. The altitude of the selected study sites was taken using GPS. Identified vegetation's' was categorized as herbaceous, shrubs, trees, grasses, etc based on its plant life form.

2.3 Data management and analysis

All collected data were entered into Microsoft Excel, filtered for any invalid entry and properly coded. Descriptive statistics like percentage was used to estimate the proportion and tables and figures were used to present summarized data. The association between honey bee forages and different agro-ecology was analyzed using SPSS version 20 statistical software.

3. Results and Discussion

3.1 Beekeeping practices

The study was conducted from 2015 to 2017 G.C. in three districts namely: Dodota, Digelu and Tijo and Lode Hetosa. The altitude of the study areas mean altitude of 2272 m.a.s.l., where the lowest (1979 m.a.s.l.) and the highest (2752 m.a.s.l.) altitude were recorded in Dodota and Digelu and Tijo districts, respectively. A total of ninety (90) beekeepers were involved in survey made to assess major bee forages resources contributing for honey production and to establish appropriate floral calendar in three selected study districts.

Out of the total 446 colony owned by beekeeper respondents, the proportion of traditional beehive was higher (67.7%) than the number of transitional and modern. The overall mean of colony owned per household in the current study areas was found to be 5.2±5.2 with a maximum ownership of 35 colonies. Gebrehaweria *et al*. (2018) reported 10.08 mean live colony ownership per household from selected districts of Afar regional state. Among the study districts, the average number of colony owned per household for Digelu and Tijo was relatively higher (6±7.3). The mean for traditional, transitional and modern beehives was 4±3.9, 2.7±1.4 and 3±5.1, respectively. Similarly, Tariku and Zerihun (2019) reported 10.5±3.8 average number of bee colonies for traditional hive, 2.9±1.9 for transitional and 1.1±1.2 for movable frame beehives from Wondo genet of southern Ethiopia.

The mean of beekeeping experience in the study districts was 15±12.5 years. As indicated in table 1, the maximum mean of experience (17.1±15.5 years) was observed in Dodota district which is characterised as lowland agro-ecology. In line with this study result, Abera (2017) reported the maximum mean experience (22.5±11.8 years) from Anjagenbo kebele located in lowland agro-ecology and 13.6±9.8 years overall mean of beekeeping experience from Jimma zone.

23.5±38.1kg of honey per household/year was found to be produced on average, whereas the mean of honey yield per traditional, transitional and modern (moveable frame) hive was 10.8±5.9kg, 19.8±17.3kg and 33.2±48.9kg, respectively. The highest and lowest mean of honey yield per household was observed in Digelu and Tijo (32.4 ± 54.3kg) and Dodota (10 ± 9.3kg) study district, respectively. As compared to this study, higher (88.75kg) average annual honey production per household was reported from selected sites of Afar region (Guesh *et al*., 2018). The highest amount of honey (22.7kg) was obtained from modern hive, followed by transitional (14.4kg) and traditional (7.5kg) beehives (figure 1). Similar to this, the findings of Guesh *et al*. (2018) and Tariku and Zerihun (2019) also indicated as moveable frame was more productive than transitional and traditional hives.

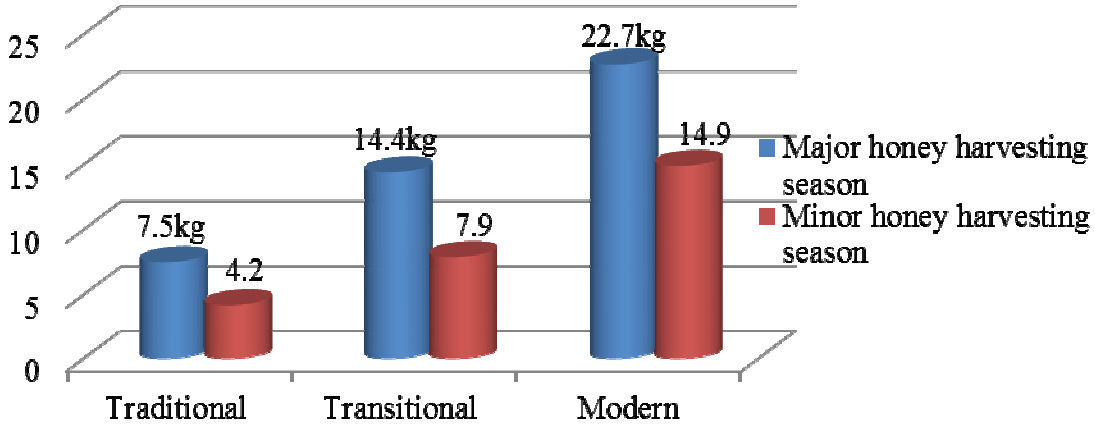

Figure 1. Per household production of honey during major and minor seasons

Honey production was conducted during two seasons namely: major and minor seasons based on the availability of bee flora. Major honeybee plants are the most important plants which are used for brood rearing and abundant honey production. In the present study area, September, October, November and December were regarded as the main honey harvesting season of the year, whereas months ranging from April to June are classified as the minor honey harvesting season. This is associated with the presence of a higher number of flowering plant species during these months due to the availability of moisture following the main rainy season, which lasts from June to August. Assemu *et al*. (2013) and Nuru (2007) reported similar study result. In contrast to this, Tura and Admassu (2019) reported months extending from March to June as the major honey flow period in southwest parts of Ethiopia.

Honey can be produced up to three times a year in the area. The majority of the respondents (61.1%) harvest honey two times a year, 34.5% of them harvest honey once a year and 4.4% of respondents three times a year. The average of honey harvesting frequency per year was 1.7±0.6. The mean of harvesting frequency for Digelu and Tijo, Dodota and Lode Hetosa study districts was 1.9 ± 0.48, 1.5 ± 0.6 and 1.7 ± 0.5, respectively (Table 1). The variation observed among districts could be due to differences on colony management practices and the flowering condition of honeybee flora in the study area. Beekeepers owning traditional hive mostly harvest honey only once a year. Similarly, Abera (2017) reported as the mean for honey harvesting trend was two times per year and its frequency ranging from one to three times a year. Study conducted in selected districts of Afar regional state also revealed that beekeepers harvest honey two to five times a year (Gebrehaweria *et al*., 2018). As shown in figure 1, the amount of honey produced per household during the major honey harvesting season was more as compared to minor season. This might be due to the availability of higher bee flora during this season.

Table 1: Summary of the beekeeping activity in three selected study districts

Variables	**Study district**		
	Digelu and Tijo	Dodota	Lode Hetosa
Mean of colony owned per household	6 ± 7.3	5.5 ± 4.7	3.4 ± 1.9
Mean of beekeeping experience	11.5 ± 8.3	17.1 ± 15.5	16.4 ± 12.4
Mean of honey yield per household	32.4 ± 54.3	10 ± 9.3	28 ± 33.6
Mean of honey harvesting frequency	1.9 ± 0.48	1.5 ± 0.6	1.7 ± 0.5

3.2 Seasonal colony management activities

Periodical dearth periods can have a serious impact on productivity of honey bee as they lead to depletion of reserved food inside the hive. The survey result indicated that in all months of the year there was feed shortage for honey bee despite variation in severity. In the current study areas, honey bee was found to be in critical shortage of forage during months ranging from December to August for Digelu and Tijo and Lode Hetosa districts and it lasts from December to April months for Dodota. Months between November to August were months when bee forage was in shortage for Digelu and Tijo and Lode Hetosa study sites. For Dodota district, this season was ranging from November to March and June to August months. Moreover, bee forage is in less shortage throughout the year except during October for Digelu and Tijo district and during February - March for Dodota and Lode Hetosa. This variation might be attributed to difference in agro-ecology of the study area. Haftom and Samuel (2016) were reported the months of December to June as dearth period in which there is no rainfall and the temperature is dry and hot. The study finding of Tura and Admassu (2018) also indicated as there is high scarcity of honeybee forage during the rainy season.

77.8% of the beekeepers agreed on making proper management for their bee colonies during different season. They provide additional feed and water the drought period (*bega* season). Supplying feed during the dearth period minimizes the effect of the drought and assists the colonies to conduct their regular activities. Various management activities such as cleaning and smoking following inspection during honey flow season, catch swarm, protect the colonies from infection, ant, spiders, bird, lizards, sun and rain are performed during different seasons to attain optimum productive potential of the colonies. Mekonen *et al*. (2019) reported similar study finding from selected areas of South Nation and Nationality People Regional (SNNPR) State of Ethiopia.

In honeybee colony, swarming, migration, absconding and brood rearing are a common phenomenon. The current study result showed that, swarming is occurred during September to November and April to June. This could be due to the availability of pollen during these months. Migration was observed during months ranging from November to April. This could be associated with inappropriate application of various chemicals and shortage of feed. Absconding was also occurred during, September and from February to July. The presence of predators including: ant, spiders, bird, lizards, bad weather conditions, poor colony management, diseases and drought were believed to be the main causes of colony absconding. The study results of Nuru (2007), Chala *et al*. (2012) and Assemu *et al*. (2013) support this finding. Brood rearing activity was also conducted from September to November and also March to August. In addition, September to November and April to June were known for honey flow seasons and drones were available throughout the year, except during December and January.

3.3 Poisonous honey bee plants

The presence of poisonous plants that kill honey bees were indicated by beekeepers. These are locally known as game, degita (the sticky part or product of the plant), yekorkoro get, yeferenj enchet, giraro, gale and hashufe. The honey produced from their pollen is also toxic to humans. Abiyu (2011) and Awraris *et al*. (2012) also reported similar findings from different parts of the country.

3.4 Identification of honey bee flora

Because of the favourable climatic conditions, a wide range of honey bee plants species grow in the in the present study districts. Based on the survey result obtained from three districts of Arsi zone, a total of 98 plant floras including trees, shrubs, herbs, cultivated crops and animal feeds and grasses were identified. A number of studies conducted in different parts of the country also revealed the presence of diversified flora for honey bee (Assemu *et al*., 2013; Haftom and Samuel, 2016; Kerealem, 2017; Kidane *et al*., 2018; Tariku and Zerihun, 2019; Tura and Admassu, 2019). The difference observed in type and number of plant species may be associated with the change in geographical location, soil type and climatic situation. Regarding the life form of plant species, the proportion of trees was relatively higher than the rest plant species (Figure 2). In agreement with this result, Haftom and Samuel (2016) and Tariku and Zerihun (2019) also indicated as trees constituted the highest proportion of the identified species.

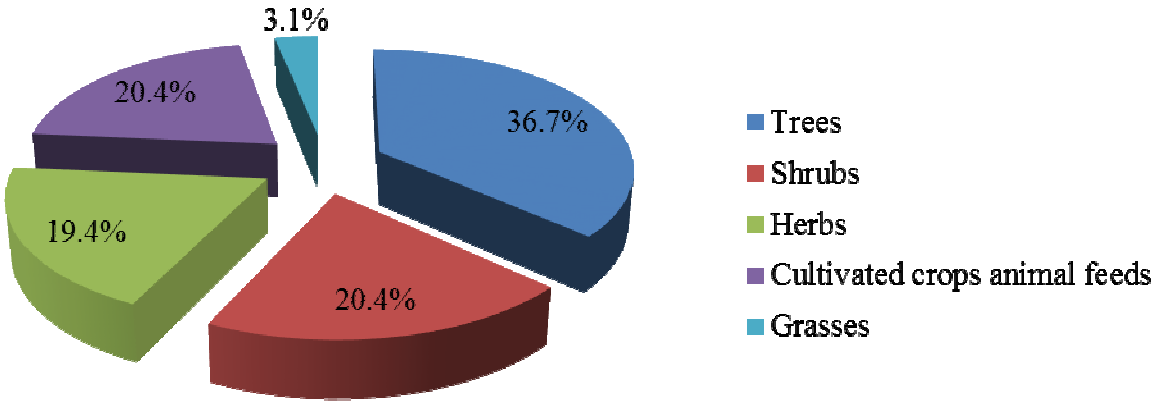

Figure 2. Proportion of plant species life form

Among honey bee floras, *guizotia scabra, equiliptus globules* and *vernonia species* were the most frequently identified plant species; followed by *vicia faba, pisum sativum, acacia tortories, croton macrostachys, cordia Africana, bidens macroptera, solanum tuberosum* and *Grewia by color* (Table 2). Higher plant frequencies are known to be the best indicators of adaptation to the area and local climates.

Table 2: List of honey bee flora identified by respondents in the study areas

Name of the plant		Plant life form	Frequency
Local name	Scientific name		
Abadabo	Galinosoga prifera	Herb	1
Abeyi	Maesa lanceolata	Shrub	1
Adado	Buddlejia polstachia	Tree	11
Adenguare	Canavalia africana	Cultivated crop	2
Adey abeba	Bidens Macroptera	Herb	27
Ajo	Acacia oerfota	Tree	2
Alfalfa	Medicago sativa	Cultivated animal feed	4
Amagito	Trifolium spp	Herb	12
Ameraro	Pruness Africana	Tree	14
Asta	Erica arboria	Shrub	1
Atefaris	Datura strmonium	Herb	2
Ater	Pisum sativum	Cultivated crop	39
Bahirzaf	Equiliptus globules	Tree	53
Bakela	Vicia faba	Cultivated crop	41
Bedeno	Balanit eygptica	Tree	5
Bekenisa	Croton macrostachys	Tree	31
Bekolo	Zea mays	Cultivated crop	17
Besobila	Saliva nilotica	Herb	2
Bika	Papacea capensis	Tree	8
Boloke	Phaseolus vulgaris	Cultivated crop	2
Buna	Coffee spp	Cultivated crop	1
Chat	Catha edulis	Shrub	1
Chokorsa	Elucine flocofolia	Grass	2
Dergu	Hypoistus forskale	Herb	11
Digeta	Senna occidentalis	Shrub	2
Dinich	Solanum tuberosum	Cultivated crop	20
Dobi	Uriticia simensis	Herb	8
Dodoti	Acacia etbaica	Tree	11
Ebicha	Vernonia species	Shrub	45
Ejersa	Olia Africana	Tree	12
Endode	Phytolacca dodocandra	Shrub	1
Gale	Impomeo purpurea	Herb	12
Gatira	Juniperus procera	Tree	2
Gerbu	Hordeum vulgare	Cultivated crop	2
Gerbi	Acacia albida	Tree	1
Gesho	Rhamnus prinoides	Shrub	5
Gomen	Brassica spp	Cultivated crop	16
Gora	Carissa spinarum	Shrub	12
Guaya	Melicoccus bijugatus	Cultivated crop	8
Gujo	Vernonia spp	Tree	1
Gulo	Ricinus cominus	Shrub	1
Hada	Guizotia scabra	Herb	63
Hadami	Oppuntini spp	Shrub	20
Haltufa	Rhubes studneri	Herb	3
Hamesa	Chommphorr aconusa spp	Tree	2
Handerku	Lannea schimperi	Tree	4
Harbu	Ficus sure	Tree	2
Harengema	Petrolobium stlatum	Tree	7
Harfetu	Shefflera abisinica	Tree	1
Hargisa	Aloe brhana	Shrub	4
Haroresa	Grewia by color	Tree	18
Hawase	Rhus retinorrhoea	Tree	3
Kacha	Agava sisalyina	Shrub	6

Name of the plant		Plant life form	Frequency
Local name	Scientific name		
Karia	Paper capes	Herb	1
Kazamiro	Kasmiroa edulis	Tree	3
Kega	Rosa abyssinica	Shrub	4
Kemedi	Triticum aestivum	Cultivated crop	4
Kerero	Pouteria adolfi-friedericii	Tree	4
Kertefa	Acacia Senegal	Tree	9
Kiltu	Ficus vasta	Tree	15
Kinchib	Euphorbia tirucalli	Shrub	3
Kosheshile	Carduus schimperi	Herb	2
Koshim	Dovyalis abyssinica	Shrub	13
Koso	Hyginia abisinica	Tree	7
Kundo berbere	Piper nigrum	Herb	2
Kurkura	Ziziphus mucranta	Tree	5
Lafto	Acacia dolicocephalus	Tree	9
Lole	Ecuberjia capensis	Tree	1
Mashila	Sorgum bicolor	Cultivated crop	15
Misir	Lens culinaris	Cultivated crop	2
Muja	Snowdenia plystchya	Herb	5
Nug	Guizotia abyssinica	Cultivated crop	3
Rukesa	Terminalia brownii fresen	Tree	5
Sardo sar	Cynadon doctylon	Grass	4
Senafich	Brassica nigra	Herb	1
Senbelet	Hyparrheniarufa	Grass	2
Sensel	Justitia shimperiana	Shrub	10
Sespania	Saspania saspan	Shrub	6
Shabe	Rumex nervosus	Herb	3
Shewshawe	Casuarina cunninghamiana	Tree	1
Shinbira	Cicer arietinum	Cultivated crop	2
Shinkurt	Allium sativum	Cultivated crop	2
Suf	Carthamus tinctorius	Herb	8
Tatesa	Rhus natalensis	Tree	5
Tedecha	Acacia tortories	Tree	38
Telba	Linum usitatissimum	Cultivated crop	7
Tena adam	Ruta chalopensis	Herb	4
Timatim	Solanum lycopersicun	Cultivated crop	3
Tosign	Thymus schimperi roninger	Shrub	2
Tree lucern	Cytisus proliferus	Shrub	11
Trimanturi	Azadirachta indica	Tree	15
Tsigereda abeba	Rosa richardii hart	Shrub	1
Ulaga	Echretia cymosa	Tree	1
Wachu	Acacia cial	Tree	2
Wanza	Cordia Africana	Tree	29
Werke	Ensete ventricosum	Herb	1
Yelam dinich	Beta vulgaris	Cultivated animal feed	1
Zegba	Podocarpus falcatus	Tree	1

3.5 Flowering season and bee floral calendar

Floral calendar is a time-table that indicates the approximate date and duration of the blossoming periods of the important honey plants (Tura and Admassu, 2018). The flowering time of honey bee plants vary from species to species and during different seasons of the year depending on the climatic conditions of their habitat. This assures a continuous supply of food for bees and this in turn contributes to an increased frequency of harvesting (Kerealem, 2017; Kidane *et al*., 2018). As shown in table 3, a bee floral calendar was developed based on the information obtained from the current study areas.

Table 3: Flowering seasons of the identified honey bee plant species

Scientific name of the plant	Month of the year											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Galinosoga prifera											■	■
Maesa lanceolata				■								
Buddlejia polstachia	■	■	■			■	■	■	■			
Canavalia africana	■											■
Bidens macroptera	■	■	■									
Acacia oerfota						■	■	■				
Medicago sativa	■	■	■					■	■	■		
Trifolium spp	■	■										■
Pruness Africana								■	■			
Erica arboria									■	■	■	
Datura strmonium	■	■	■									
Pisum sativum	■	■	■									
Equiliptus globules	■	■	■	■	■	■	■	■	■	■	■	■
Vicia faba	■	■	■									■
Balanit eygptica	■	■				■	■	■	■	■		■
Croton macrostachys	■					■	■	■				■
Zea mays	■	■	■						■	■	■	■
Saliva nilotica	■	■	■									
Papacea capensis	■	■			■	■	■	■	■		■	■
Phaseolus vulgaris	■										■	■
Coffee spp		■							■			
Catha edulis	■	■							■	■		
Elucine flocofolia	■	■										■
Hypoistus forskale	■	■	■							■	■	■
Senna occidentalis	■	■	■	■							■	■
Solanum tuberosum	■	■	■	■	■	■	■	■	■	■	■	
Uriticia simensis	■	■				■	■	■	■			
Acacia etbaica					■	■	■	■	■	■		
Vernonia species	■	■	■	■	■	■	■	■	■	■	■	■
Olia Africana	■	■	■		■	■	■	■	■			
Phytolacca dodocandra		■	■	■								
Impomeo purpurea	■	■				■	■	■	■	■	■	■
Juniperus procera						■	■	■	■			
Hordeum vulgare	■	■								■	■	■
Acacia albida								■	■			
Rhamnus prinoides	■	■	■			■	■	■	■	■		■
Brassica spp	■	■										■
Carissa spinarum	■	■	■			■	■	■	■	■		
Melicoccus bijugatus	■	■	■	■								
Vernonia spp									■			
Ricinus cominus		■	■									
Guizotia scabra	■	■	■	■	■					■	■	■
Oppuntini spp	■	■	■	■	■	■	■	■	■	■	■	
Rhubes studneri		■	■			■	■	■	■			
Chommphorr aconusa spp						■	■	■	■	■		
Lannea schimperi						■	■	■	■	■		
Ficus sure								■	■	■		
Petrolobium stlatum		■	■					■	■	■		
Shefflera abisinica						■	■					
Aloe brhana	■	■	■	■	■	■	■	■				
Grewia by color	■	■	■		■	■	■	■	■	■	■	■
Rhus retinorrhoea	■	■					■	■	■			
Agava sisalyina	■	■		■	■	■	■	■	■			

Scientific name of the plant	Month of the year											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Paper capes	■											
Kasmiroa edulis				■	■	■	■					
Rosa abyssinica		■	■					■	■			
Triticum aestivum	■	■										
Pouteria adolfi-friedericii	■	■	■	■	■	■	■	■	■	■		
Acacia Senegal						■	■	■	■	■		
Ficus vasta	■	■	■	■	■	■	■	■	■	■	■	■
Euphorbia tirucalli							■					
Carduus schimperi		■	■	■	■	■						
Dovyalis abyssinica	■	■	■					■	■	■		
Hyginia abisinica	■	■	■					■	■			
Piper nigrum									■	■		
Ziziphus mucranta	■	■	■		■	■	■	■	■	■	■	
Acacia dolicocephalus	■	■	■		■	■	■	■	■	■		
Ecuberjia capensis	■	■	■	■	■	■	■	■	■	■	■	■
Sorgum bicolor	■	■										■
Lens culinaris		■										
Snowdenia plystchya	■	■	■	■							■	■
Guizotia abyssinica	■	■	■									
Terminalia brownii fresen	■	■				■	■	■				
Cynadon doctylon	■	■							■	■		■
Brassica nigra	■	■										
Hyparrheniarufa	■	■							■	■		■
Justitia shimperiana	■	■	■						■	■		
Saspania saspan	■	■	■				■	■	■			
Rumex nervosus	■								■	■	■	■
Casuarina cunninghamiana		■										
Cicer arietinum				■	■							
Allium sativum	■	■	■	■							■	■
Carthamus tinctorius	■	■	■						■	■		
Rhus natalensis	■	■										■
Acacia tortories	■	■			■	■	■	■	■	■	■	■
Linum usitatissimum	■									■		
Ruta chalopensis	■	■										
Solanum lycopersicun	■	■	■									■
Thymus schimperi roninger									■		■	■
Cytisus proliferus	■	■	■			■	■	■	■			
Azadirachta indica	■	■	■	■	■	■	■	■	■	■	■	■
Rosa richardii hart								■				
Echretia cymosa								■				
Acacia cial	■	■	■	■					■	■		
Cordia africana	■	■	■	■	■	■	■	■	■	■	■	■
Ensete ventricosum		■										
Beta vulgaris			■	■	■	■	■					
Podocarpus falcatus									■	■		

4. Conclusion and Recommendation

The present study revealed that beekeeping activity is one of the potential sources of income for agrarian community in the area. Different plant species such as: tree, shrub and herb were identified as the major resource of bee flora. Bee colony strength and honey production depends on the availability of bee floras. The finding of this study also indicated that there is a variation on seasonal availability of honeybee forages. Honey bee was found to be in critical shortage of forage during months ranging from December to August. The knowledge in the identification of honey bee flora and their flowering time has therefore paramount importance in assisting beekeepers to establish appropriate colony management calendar and honey flow season.

Based on the above conclusion, the following recommendations are forwarded:-

- ✓ Beekeeping practices should be integrated with crop cultivation and natural resource conservation.
- ✓ Further detail studies focusing on bee flora should be conducted.
- ✓ Awareness creation of experts and farmers on seasonal management of beehives through training is required.

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