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Identification of types, flowering of bee plants and honey production of *Apis cerana* in Aornakan I and Kutatinggi Villages, Pakpak Bharat Regency, North Sumatra

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ABSTRACT
One of the influential factors in the success of beekeeping is the availability of bee feed. Beekeepers need to know the types of food sources for bees and have a map of the sources of nectar and pollen in their area. This will help in planning the management of their colony. This research was conducted to identify the types and flowering of bee feed plants (*Apis cerana*) and to determine honey production. In this study used exploratory survey methods and interviews. Based on the study's results, there were 17 identified types of bee feed sources from forestry plants, 13 identified plant species from crops and 6 identified plant species that produce flowers. The flowering schedule for honey bee feed plants in Pakpak Bharat Regency for Kaliandra plants blooms in February - July, for Durian plants blooms in March, April - October, and November for Coffee plants flowers in April and August. Honey production in Pakpak Bharat District has a different frequency of harvest and production each month. For April, 11 members produced 42 bottles of honey. For May, 10 members produced 55 bottles, where the size per bottle was 600 ml.
Keyword: *Apis cerana*, Bee Feed, Pakpak Bharat

1. Introduction

Indonesia is a tropical country that has abundant natural wealth in the form of flora and fauna. One of the fauna that is beneficial to humans is the honey bee. The results that can be obtained from raising honey bees are honey, pollen, royal jelly, propolis, and beeswax. The resulting product can benefit breeders economically by providing jobs and increasing income.

One of the influential factors in the success of beekeeping is the availability of bee feed. Honey bees' food sources include fruit plants, vegetable plants, ornamental plants, food plants, forest plants, and plantation plants. Indonesia has a very large forest area, with plants of various types and flowering alternately throughout the year. So, cultivating honey bees has a great opportunity. Plants in Indonesia are abundant and of multiple types, which are an ideal feed source for honey bee cultivation [1]. The abundance of plant sources of nectar and pollen will have a major impact on the productivity of honey. Beekeepers need to know the types of food sources for bees and have a map of nectar and pollen sources in their area. This will help in planning the management of their colony [2].

Production of agriculture, plantations, and non-timber forest products in the form of flowers and fruit becomes optimal with the pollination services of honey bees. Honey bees (*Apis cerana*) and flowering plants have a mutually beneficial relationship; plants provide bee feed in the form of nectar and pollen, while honey

bees pollinate these plants. Honey bees obtain nectar and pollen from plant flowers which are collected continuously by worker bees.

Almost all flowering plants can be a food source for bees, but several types of flowering plants produce toxic compounds, so bees and insects do not visit them in general. Based on the research results of [3], 18 types of plants are a source of food for honey bees (*Apis cerana*), namely: Seri (*Muntingia calabura*), Kelapa Gading (*Cocos nucifera*), Rimbang (*Solanum torvum*), Acacia (*Acacia auriculiformis*), Water guava (*Syzygium aquerum*), Putri Malu (*Mimosa pudica*), Ketapang (*Terminalia catappa*), Apadan (*Microcos tomentos*), Israel Grass (*Asystasia gangetica*), Princess Palm (*Veitchia merrilli*), Water jasmine (*Eugenia aquea*), Kaffir lime (*Citrus hystrix*), King Palm (*Roytonea regia*), Dadap Flower (*Erythrina cristagali*), Mango (*Mangifera indica*), Coconut Hybrid (*Cocos nucifera*), Longan (*Dimocarpus longan*), and Randa Tapak (*Taraxacum officinale*). Honey farmers greatly assist the process of pollinating plants around the forest to reproduce and vice versa the honey bees also get food from these plants [4].

One of the factors that affect plant growth and production is climate. Based on the description of the climate, the type of vegetation that grows in a location can be identified. To find out whether plants can live according to a certain climate, more detailed growing conditions and weather information are needed from several decades, with monthly average values and distribution patterns throughout the year [5]. Climatic elements important for plant growth include rainfall, temperature, humidity, dry months (rainfall less than 60 mm/month), and altitude above sea level. Therefore, mapping the climate suitability of plant species must be carried out continuously to determine the effects of climate change on their suitability level, such as forage crops.

Global climate change, which changes the pattern of the dry and rainy seasons above normal, impacts plant flowering, such as changing plant flowering schedules. The success of the honey bee farming business depends on feed availability. For the continuity of the honey bee farming business, the honey beekeepers must always know the presence of feed. This can be made easier with the help of a flowering calendar. Therefore, this study aims to determine the types of plants that are the source of honey bee feed, honey production, and the effect of rainfall on the flowering of these forage plants.

2. Method

2.1. Data Collection

This research was conducted from March 2022 to July 2022. It was carried out in the villages of Aornakan I and Kutatinggi, Pakpak Bharat Regency, as seen in Figure 1.

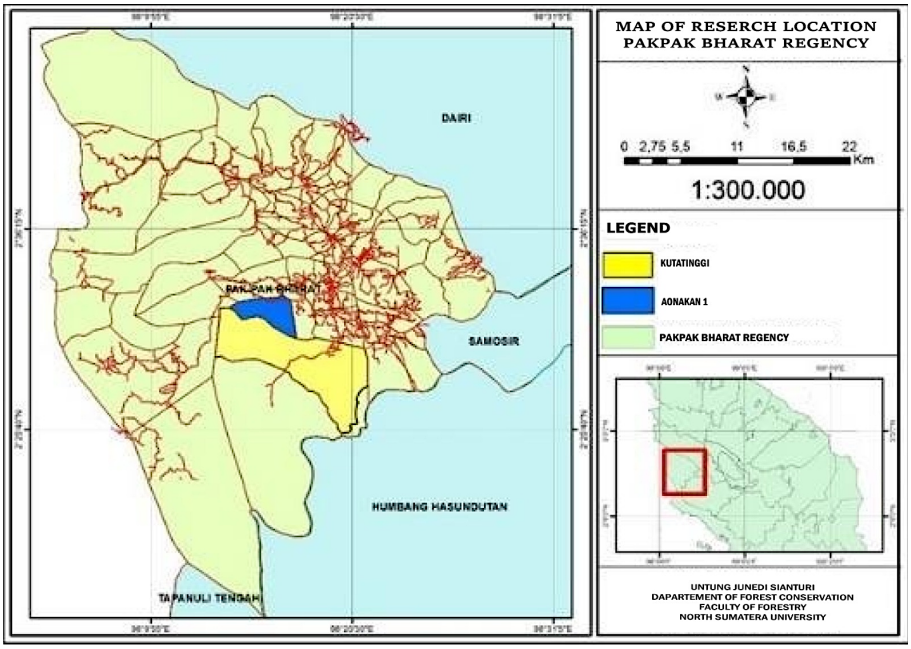


Figure 1. Map of Research Locations

2.2. Data analysis

2.2.1. Identification of Forage Plants

The types of plants obtained were recorded and described for tree vegetation and undergrowth to form profiles of plant species for honey bees. Mapping was also carried out to see the distribution of forage plants around the honey bee farm location with the coordinates previously taken.

2.2.2. Cohran's test

The results of this study were analyzed statistically using the Cohran test. The Cohran test is used on data with a nominal measurement scale or information in two separate forms (dichotomous), for example, "yes" or "no" information. This test is used to determine the existence of a relationship between several variables.

$$Q = \frac{(k-1)\left[k\sum_{j=1}^{k} Gj^2 - \left(\sum_{j=1}^{k} Gj\right)^2\right]}{k\sum_{i=1}^{N} Li - \sum_{i=1}^{N} Li^2} \quad (1)$$

Information: k : Number of columns (number of months)
N : Number of rows in the table (number of respondents)
Rj : Number of ranks in the column [6].

The values of these variables were obtained from the analysis of interview data. If the Q value has been received, the Q value is compared to the chi-square table (95% confidence level) with the following rules:

H0 : There is no correlation between flowering time and rainfall at a 95% confidence interval.
H1 : There is a correlation between flowering time and rainfall at a 95% confidence interval.

If Q-count < Q-table, then H0 is accepted, and H1 is rejected, so there is no significant correlation between flowering time and rainfall. If Q-count > Q-table, then H0 is rejected, and H1 is accepted, so it is found that there is an absolute correlation between flowering time and rainfall.

3. Result and Discussion

3.1. Identification of Bee Food Source Plants

From the observations in the field, it can be seen that plants that have the potential to be a source of bee food consist of forestry plants, plantation/agriculture plants, ornamental plants, and grasses. The types of plants favored by honey bees, nectar, and pollen are the primary binders for bees to come to a plant. Meanwhile, the characteristics of plants visible from the outside, such as flower color, flower aroma, and flower shape are secondary binders because they only cause stimulation to the sensory organs [7].

Flowers have different properties from one another in color, shape, aroma, and nectar production. Etc. The difference in these characteristics causes the attractiveness of honey bees to flowers to also vary [8]. Flower color is one factor that attracts honey bees to come to flowers. Bees visit flowers that have different colors [7]. Bees are more likely to go to open flowers or flower shapes, which makes it easier for honey bees to collect nectar or pollen.

At the research location, 36 types of plants could be found and identified as potential food sources for honey bees. The following 17 types of forage crops consist of forestry plants, as shown in Table 2, and the profile of each forage crop will be discussed further.

The areas of Aornakan Village and Kutatinggi Village have diverse plant sources for bee food, ranging from forestry to agricultural and other flowering plants. Based on the research results, 17 types of forest plants are a food source for bees obtained from a radius of 500 m from the center point of honey bee cultivation for each member of the Forest Farmers Group.

Table 1 presents the types of forest plants that are the source of *Apis cerana* bees found at the study site. All of the 17 plants, 2 were found the most: Calliandra (*Calliandra calothyrsus*) and Cinnamon (*Cinnamomum verum*). These plants are also commonly known by the surrounding community, although this introduction is

only limited to simple utilization. There are 17 types of plants found in the research location, and they will be described as follows:

Table 1. Forest Plants Source of Bee Feed

No	Forage Plants	Feed Status	State of Flowers	Total	
				Village 1	Village 2
1.	Calliandra (*Calliandra calothyrsus*)	n	b	36	24
2.	Mahogany (*Swietenia macrophylla*)	n	Tb	9	2
3.	Durian (*Durio zibenthinus*)	n	Tb	27	32
4.	Palm (*Arenga pinnata*)	np	b	12	15
5.	Candlenut (*Aleurites moluccana*)	n	Tb	-	9
6.	Lambtoro (*Leucaena leucocephala*)	p	B	29	21
7.	White Teak (*Gmelina arborea*)	p	B	-	17
8.	Jengkol (*Archidendron pauciflorum*)	p	B	18	15
9.	Cinnamon (*Cinnamomum verum*)	p	Tb	35	26
10.	Sengon (*Albizia chinensis*)	n	B	9	13
11.	Avocado (*Persea americ*ana)	p	B	-	22
12.	Jackfruit (*Artocarpus heterophyllus*)	np	Tb	7	-
13.	Rambutan (*Nephilium lappaceum*)	n	B	-	5
14.	Bamboo (*Dendrocalamus asper*)	n	Tb	-	9
15.	Ketapang (*Terminalia catappa*)	np	B	15	9
16.	Dalung dalung (*Lithocarpus elegans*)	N	B	7	16
17.	Suren (*Toona sureni*)	Np	B	13	-
	Total			234	226

Information: n: nectar
np: nectar and pollen
b: flowering
tb: not flowering

3.2. Calliandra (Calliandra calothyrsus)

Calliandra with red flowers can flower throughout the year to meet the needs of honey bee forage. The red flower Kaliandra found in the villages of Aornakan I and Kutatinggi, is commonly found in community garden areas that grow wild or are deliberately planted. *Calliandra calothyrsus* can flower all year round but usually experiences a peak flowering period three months before the start of the dry season. Calliandra nectar is golden yellow and is widely available in the morning around 06.00 – 10.00, when many *Apis cerana* bees, A. *mellifera*, Trigona sp., and wasps collect nectar [9].

Figure 2. Calliandra (*Calliandra calothyrsus*)

3.3. Durian (Durio zibenthinus)

Durian is a potential nectar producer, but its flowering pattern is seasonal and usually only flowers 1-2 times a year. In general, durian flowers bloom in the afternoon at 16.00 WIB. The flowers spread a fragrant aroma to attract the attention of bats as the main pollinator. The number of durian flowers in one tree during the flowering season is relatively abundant. It is spread across almost every stem where flowers come out, even on the main stem, depending on the type. Breeders widely use the potential of this flower as a location for laying stup and honeycomb (glodokan) of honey bees, so a lot of honey is circulating in the market as durian honey [10].

Figure 3. Durian (*Durio zibenthinus*)

The Table 2, presents the types of agricultural plants that are the source of *Apis cerana* bees found at the study site. The table explains the feed status and the state flowers of the forage plants.

Table 2. Agricultural Plants Source of Bee Feed

No.	Forage Plants	Feed Status	State of Flowers	Total	
				Village 1	Village 2
1.	Corn (*Zea mays*)	p	b	28	17
2.	Rice (*Oryza sativa*)	p	tb	12	9
3.	Chocolate (*Theobroma cacao*)	n	tb	6	8
4.	Sweet Orange (Citrus)	np	b	5	7
5.	Coffee (*Coffea arabica*)	np	b	26	23
6.	Banana (*Musa paradisiaca* L.)	np	b	7	9
7.	Guava (*Psidium guajava*)	np	b	3	2
8.	Coconut (*Cocos Nucifera*)	np	b	2	5
9.	Water Guava (*Syzygium aquaeum*)	n	b	-	3
10.	Papaya (*Carica papaya*)	np	b	2	4
11.	Rubber (*Hevea brasiliensis*)	n	tb	-	1
12.	Sugarcane (*Saccharum officinarum*)	n	tb	-	4
13.	Eggplant (*Solanum melongena*)	np	b	7	2
	Total			98	94

Information: n: nectar
np: nectar and pollen
b: flowering
tb: not flowering

Based on Table 3 above, it can be seen that there are 13 types of plants originating from agriculture/plantation as honey bee feed that can be identified. All 13 plants, are the most commonly found in coffee (*Coffea* sp). Plants found at the research location will be described as follows:

3.4. Corn (Zea mays)

Corn is a type of agricultural commodity currently widely planted and developed. Apart from the relatively easy maintenance, the seed technology from corn is also modern, namely super corn seeds with a planting period of 90 days ready for harvest. We find a lot of corn in the vornakan I and Kutatinggi villages in community gardens. Based on Table 3, corn is a pollen source for honey bees.

Figure 4. Corn (*Zea mays*)

3.5. Coffee (Coffea sp.)

Coffee can be found in the two research location villages. However, there are differences in coffee varieties found between the two villages. Aornakan I village cultivates robusta coffee (*Coffea canephora*), while Kuta Tinggi village cultivates arabica (*Coffea arabica*) and robusta (*Coffea canephora*) coffee. This is due to the suitability of coffee at the height where it grows. Based on Table 2, coffee is a source of nectar and pollen for honey bees. In the observations it has made flowering coffee in May and August.

Figure 5. Coffee (*Coffea sp.)*

The type of wild plants/flowers are presented in Table 3. There are several plants found in the research location with their characteristic.

Table 3. Wild plants/flowers

No.	Forage Plants	Feed Status	State of Flowers	Total	
				Village 1	Village 2
1.	Cat Whiskers (*Orthosiphon aristatus*)	n	b	14	9
2.	Cats (*Nepeta cataria*)	n	b	11	6
3.	Sigresing (*Coleus blumei*)	n	b	9	5
4.	Wild quinine (*Parthenium integrifolium*)	p	b	23	19
5.	Hibiscus (*Hibiscus rosa-sinensis*)	p	b	2	2
6.	Sunflower (*Helianthus annuus*)	np	tb	11	9
	Total			70	50

Information: n: nectar
np: nectar and pollen
b: flowering
tb: not flowering

Based on Table 3 above, it can be seen that there are 6 types of plants originating from wild plants/flowers as honey bee feed that can be identified. Among them, many are found growing wild-like shrubs, and many are also found planted both around the yard of the house and around the point where the stup is placed.

3.6. Sigresing (Coleus blumei)

One of the plants with the potential as a nectar source is the *Coleus blumei* Benth plant [11]. *Coleus blumei* Benth plant was chosen for several reasons. It is a cultivated and ornamental plant, suitable for planting in the lowlands and highlands, growing wild and thriving in the lowlands to an altitude of 1,500 m above sea level.

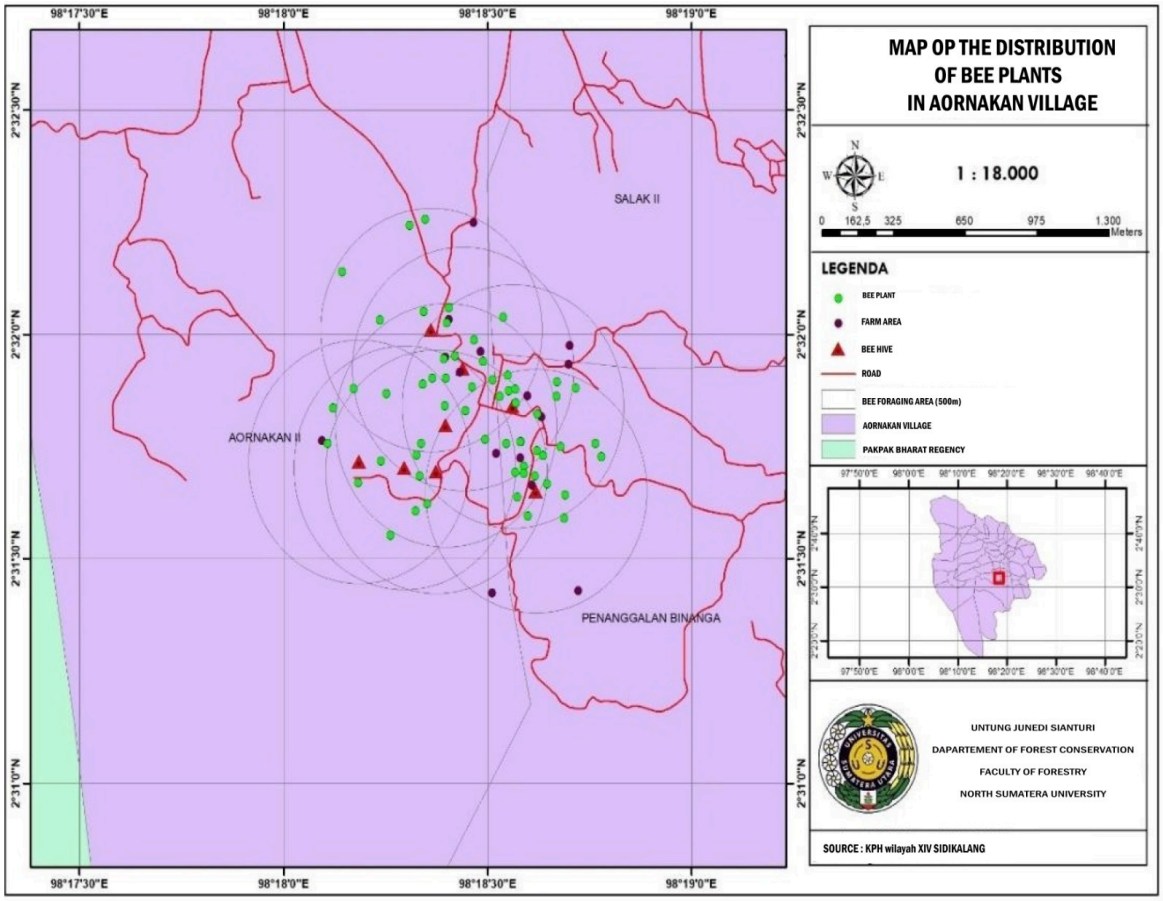
Figure 6. Sigresing Flower (*Coleus blumei*)

3.7. Wild quinine (Parthenium integrifolium)

Wild quinine flowering plants had the highest number of all species at the study site. This plant is a source of pollen for honey bees. In Table 3 it is explained that the number found in Aoarkan village was 23 plants, and in Kutatinggi village, there were 19 plants.

Figure 7. Wild quinine (*Parthenium integrifolium*)

The visualisation of the distribution of bee plants are presented in figure 8 and 9. There are 8 stup bee points scattered in Aoarkan Village and 11 stup in Kuta Tinggi Village. Point of bee forage plants scattered within a radius of 500 m.



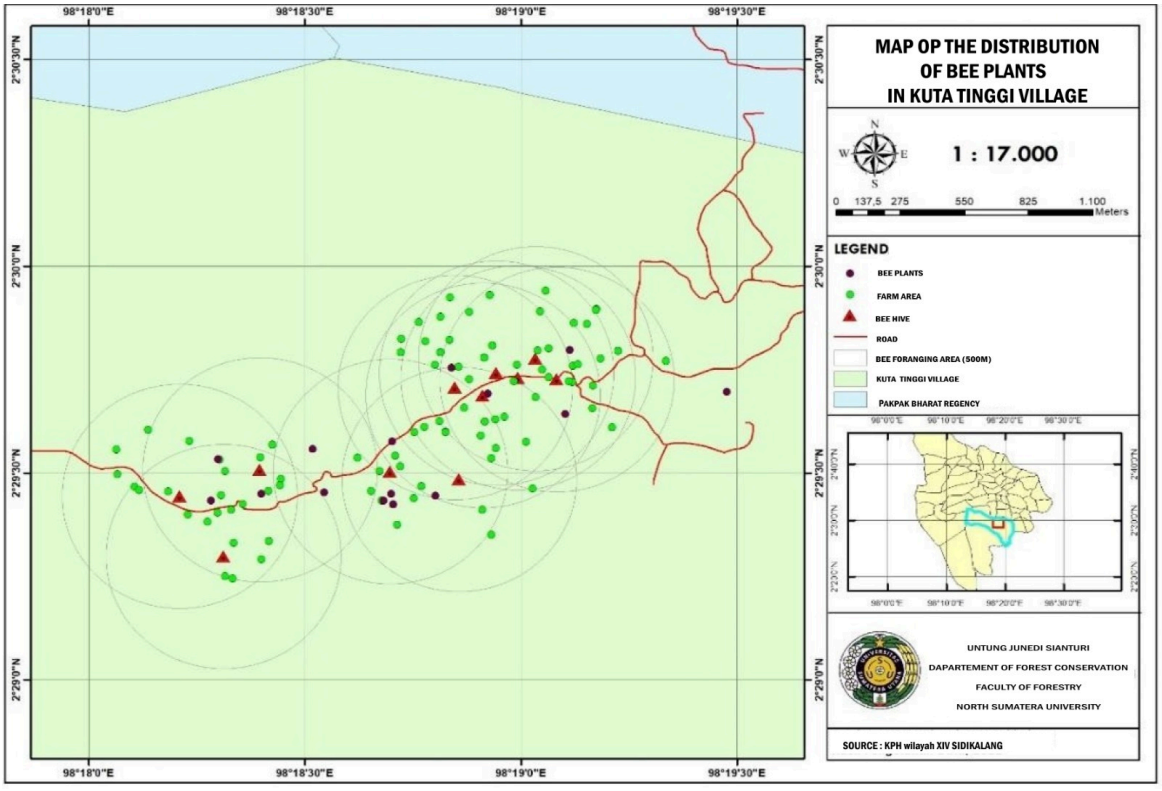


Figure 8. Map of the Distribution of Bee Plants in Kuta Tinggi Village (above); map of the Distribution of Bee Plants in Aornakan Village (below)

3.8. Data on Flowering Schedules of Honey Bee Forage Plants According to Respondents in Pakpak Bharat District

The results of statistical tests on the data submitted by respondents using the Cohran test in 2020 (can be seen in table 5) Qcount > Qtable (41.92 > 19.67), with the same test in 2021 (can be seen in table 5) also obtained Qcount > Qtable, which means there is a significant difference in the flowering time of calliandra plants in various months in Salak District.

Table 5. Calculation results of the Cohran test on calliandra flowering data

Location/District	Q value 2020		C Value 2021	
	Q value	Q tab	Q value	Q tab
Kutatinggi (Salak)	41.92*	19.67	44.93*	19.67
Aornakan (PGGS)	39.9*	19.67	40.25*	19.67

In 2020 calliandra flowering season is from March to June. Whereas in 2021, the beginning of the flowering season shifts faster, so calliandra flowering is seen from February to July. The change in calliandra flowering to be faster or slower than before is proof of that. Climatic factors influence the flowering of calliandra plants conditions (microclimate) affect calliandra flowering. In their natural habitat, calliandra flowers are produced mainly at the end of the rainy season and the beginning of the dry season, while the fruit develops in the dry season [9].

Based on statistical tests on the data submitted by respondents using the Cohran test in 2020 (can be seen in Table 5), Qcount > Qtable (39.9 > 19.67) is obtained, with the same test in 2021 (can be seen in Table 5) also obtained Qcount > Q table, which means there is a significant difference in the flowering time of Kalindra plants in various months in Pergetteng Getteng Sengkut District. In 2020 calliandra flowering season is from January to July. Whereas in 2021, the beginning of the flowering season shifts faster, calliandra flowering is seen from January to June.

Table 6. Cohran test calculation results on durian flowering data

Location/District	Q value 2020		C Value 2021	
	Q value	Q tab	Q value	Q tab
Kutatinggi (Salak)	33.8*	19.67	40.6*	19.67
Aornakan (PGGS)	15.4*	19.67	33.8^{tn}	19.67

The results of statistical tests on the data submitted by respondents using the Cohran test in 2020 (can be seen in table 6) Qcount > Qtable (33.8 > 19.67), with the same test in 2021 (can be seen in table 6) also obtained Qcount > Qtable (40.6 > 19.67), which means that there are significant differences in the flowering time of Durian plants in various months in Salak District. The results of testing the data using statistical tests in 2020 and 2021 obtained real test results that durian flowering in Salak District was affected by the rainy period, and flowering at the time stated by the respondents, durians flower at lower rainfall than usual rainfall. In 2020 this plant will flower in March and October, while in 2021, this plant will be seen blooming in April and September. Durian plants require stimulation of low rainfall for flowering. Dry months of 1-2 months are needed to stimulate the flowering of Durian plants [12]. Such low rain in January and February resulted in the emergence of flowers in March-April.

The results of statistical tests on the data submitted by respondents using the Cohran test in 2021 (can be seen in table 6) Qcount > Qtable (33.8 > 19.67), with the same test in 2021 (can be seen in table 6) obtained Qcount < Qtable (15.4 <19.67), which means that there are no significant differences in the flowering time of Durian plants at various months in Pergetteng Getteng Sengkut District. The results of statistical tests using the Cohran test on respondents who know the durian flowering schedule in this area in 2021 show real results, and durian flowering is affected by rainy periods. The durian flowering season also corresponds to the time stated by the respondents. Based on climate factor data in climate type A, durian plants flower in relatively low rainfall 1-2 months earlier. In 2020, it was different; the results were not real, meaning that the rainy season did not affect durian flowering.

Table 6. Cohran test calculation results on coffee flowering data

Location/District	Q value 2020		C Value 2021	
	Q value	Q tab	Q value	Q tab
Kutatinggi (Salak)	33.8*	19.67	36.52*	19.67
Aornakan (PGGS)	31.54*	19.67	25.0*	19.67

Statistical test results on the data submitted by respondents using the Cohran test in 2020 (can be seen in table 7) Qcount > Qtable (33.8 > 19.67) obtained, with the same test in 2021 (can be seen in table 7) also obtained Qcount > Qtable (36.52 > 19.67) which means there are significant differences in the flowering time of coffee plants in various months in Salak District. The results of statistical tests on interview data in 2020 and 2021 obtained real results, which means that the flowering of coffee plants is affected by the rainy period and according to the time stated by the respondents. The flowering season in question consists of two periods: the first flowering season, March-April, and the second flowering season, August-September. Coffee plants require low rainfall stimulation to flower, requiring only 2-3 dry months to stimulate coffee plant flowering. Drought for more than 3 consecutive months causes leaves and twigs to dry out and leaves many seeds empty [13].

The results of statistical tests on the data submitted by respondents using the Cohran test in 2020 (can be seen in table 7) Qcount > Qtable (31.54 > 19.67), with the same test in 2021 (can be seen in table 7) also obtained Qcount > Qtable (25.0 > 19.67) which means there are significant differences in the flowering time of coffee plants in various months in the PGGS District. The results of statistical tests on interview data in 2020 and 2021 obtained real results, which means that the flowering of coffee plants is affected by the rainy period and according to the time stated by the respondents. Based on respondents' statements, in 2021, the coffee plants also look to flower in January, February, and April, where the data is very diverse. We can see this condition from the unstable fluctuations in rainfall in that month.

Table 8. Flowering calendar for honey bee plants in Pakpak Bharat Regency in 2020

Jenis Tanaman	Flowering Period											
	J	F	M	A	M	J	J	A	S	O	N	D
	A Climate type											
Kaliandra		*	*	*	*	*	*					
Durian			**								**	
Kopi				*				*				
	E2 Climate type											
Kaliandra			*	*	*	*	*					
Durian			*							*		
Kopi				*				*				

Information: *It is found that there is a flowering season (statistically, the results are real)
**Found the flowering season (the statistical test results are not real)

Table 9. Flowering calendar for honey bee plants in Pakpak Bharat Regency in 2021

Jenis Tanaman	Flowering Period											
	J	F	M	A	M	J	J	A	S	O	N	D
	A Climate type											
Kaliandra		*	*	*	*	*	*					
Durian			**								**	
Kopi				*				*				
	E2 Climate type											
Kaliandra			*	*	*	*	*					
Durian			*							*		
Kopi				*				*				

Information: *It is found that there is a flowering season (statistically, the results are real)
**Found the flowering season (the statistical test results are not real)

3.9. Honey Production in Kuta Tinggi Village by KTH Dos Ukur Mersada and in Aornakan Village by KTH Pemuda Tani

Honey production data was taken from two forest farmer groups, namely KTH Dos Ukur Mersada and KTH Pemuda Tani. Honey bees are harvested in April. Honey bee production data at the study site can be seen in the following table:

Table 10. Amount of honey harvested in April (KTH Dos Ukur Mersada)

No.	Member's name	Number of Stup	Harvest Frequency	Production Amount of Honey/ Bottle (600 ml)
1.	Sehat Tumangger	50	2	13
2.	Martua Tumangger	15	1	5
3.	Makto Manik	8	1	3
4.	Lambiccar Tumangger	11	1	2
5.	Wardi Manik	20	2	9
6.	Pittor Sinamo	7	1	2

Which can be seen in tables 10 and 11; in April there were 6 members of KTH Dos Ukur Mersada and 5 members of KTH Pemuda Tani harvesting honey bees. From the honey production table results, Mr Sehat Tumangger obtained the most 13 bottles (600 ml) with 1 bottle (600 ml) of beads with a harvesting frequency of 1 time in April.

Table 11. Amount of honey harvested in April (KTH Pemuda Tani)

No.	Member's name	Number of Stup	Harvest Frequency	Production Amount of Honey/Bottle (600 ml)
1.	Pittor Sinamo	7	1	3
2.	Daniel Manik	2	1	1
3.	Kasdin Manik	6	1	2
4.	Topa H Sinamo	4	1	1
5.	Rumondang Manik	3	1	1

From the honey harvest in May, which can be seen in Tables 12 and 13, 6 members of KTH Dos Ukur Mersada and 4 members of KTH Pemuda Tani harvesting honey bees.

Table 12. Amount of honey harvested in April (KTH Dos Ukur Mersada)

No.	Member's name	Number of Stup	Harvest Frequency	Production Amount of Honey/Bottle (600 ml)
1.	Sehat Tumangger	50	2	19
2.	Martua Tumangger	15	1	3
3.	Makto Manik	8	1	5
4.	Lambiccar Tumangger	11	1	2
5.	Wardi Manik	20	2	14
6.	Pittor Sinamo	23	1	6

From the honey production table results, Mr Sehat Tumangger obtained the most 19 bottles (@600 ml) with a harvesting frequency of 2 times in May. This happened because the number of stup/honeycombs from Mr Sehat Tumangger was the largest among all KTH members. Also, the placement of the nests followed the sources of the surrounding forage plants, such as in the cornfields, around the house's yard, where there are many flowers. Meanwhile, Topa Sinamo and Rumondang Manik produced the least amount of harvest (@600 ml) with a harvesting frequency of 1 time in May.

Table 13. Amount of honey harvested in April (KTH Pemuda Tani)

No.	Member's name	Number of Stup	Harvest Frequency	Production Amount of Honey/Bottle (600 ml)
1.	Pittor Sinamo	7	1	2
2.	Kasdin Manik	6	1	2
3.	TopaH Sinamo	4	1	1
4.	Rumondang Manik	3	1	1

The amount of honey production difference is also caused by the number of stup/mounds owned by each member. Therefore, KPH XIV Sidikalang assisted in the form of a stup for each member to increase honey production. Other factors, such as flowering plants around the location of the stup/honeycomb are placed. This plant is the main food for honey bees searching for nectar and pollen. Based on direct observation of stup/honeycomb, many are placed in locations such as rice fields, corn, and community coffee plantations. This follows [14], who revealed that most plants that produce flowers could be used as a food source from forests, plantations or agricultural plants.

4. Conclusion

Identification of types of honey bee plants in Kutatinggi Village (Salak District) and Aornakan Village (PGGS District) Pakpak Bharat Regency, consisting of forestry plants, crops, and other plants that produce flowers. Several forage plants were found from an exploratory survey with a radius of ± 500 meters from where the beehives were placed. From forestry plants, 17 species were identified, 11 types were identified from agricultural plants, and 8 from other plants that produce flowers. The honey production by KTH Dos Ukur Mersada and KTH Pemuda Tani Pakpak Bharat Regency has a different monthly harvest and production frequency. For April, 11 members produced 42 bottles of honey. For May, 10 members produced 55 bottles of 600 ml each. The flowering of honey bee plants (calliandra, durian, and coffee) is affected by rainfall which makes the plants flower at the end of the rainy season. Flowering Schedule For honey bee plants in Pakpak Bharat Regency, Calliandra flowers in February-July, Durian plants in March, April-October, and November, and coffee plants in April and August.

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