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Utilization of Medicinal Plants in Turi Putih Village, Blitar, East Java and Antibacterial Tests against *Staphylococcus aureus* and *Escherichia coli*

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Abstract

Plants contain compounds that can be considered as antimicrobials. The community of Turi Putih Village have used plants that have medicinal properties to treat certain diseases, especially those caused by bacteria. For this reason, it is necessary to conduct research on the use of medicinal plants and antibacterial tests from plants originating from Turi Putih Village. The purpose of this study was to determine the diversity of medicinal plants, plant parts used, preparation and use of medicinal plants by the local community, as well as the antibacterial potential of medicinal plants that have High score of Use Value (UV) and Fidelity Level (FL) to treat those diseases. Data was collected by using semi-structural interviews and respondents were chosen by purposive sampling. To analyze the data, we adopted qualitative and quantitative ethnobotanical technique. Qualitative, namely descriptive methods to make an inventory of the composition of medicinal plants and preparation and use by the community, and quantitative to see the most commonly used and most preferred species ethnomedicinal plant species for treating certain ailments. . Based on interviews with respondents, the community uses 44 species of medicinal plants, 40 genus that belong to 26 plant families to treat 19 diseases caused by bacteria. Based on UV and FL scores, mint leaves (*Mentha piperita*) and kencur leaves (*Kaempferia galanga*) had the highest scores. The results showed that mint leaves and kencur leaves have antibacterial activity by forming an inhibition zone against *Staphylococcus aureus* and *Escherichia coli*. In this study, extract from leaf of *K. galanga* appeared to be more potent than that of leaf of *M. piperita*, and produced consistent level of inhibition of bacterial growth. Since it was revealed that the leaves extract of *Kaempferia galanga* has the ability to inhibit the growth of *Staphylococcus aureus* – food – poisoning organism, hence, it would be interesting to investigate the potentially of this plant for possible application in foods to promote safety.

Keyword: Antibacterial, Turi Putih Village, Medicinaal Plants, UV, FL

Introduction

Indonesia is one of country that had many potential medicinal plants. Approximately there are 9600 plant species that have medicinal properties, but only about 200 species that have been used in traditional medicine industry (Herdiani,2012). This country is occupied by different ethnic group because of the abundant natural resources and culture.

Each of these communities has a personal knowledge on therapeutic uses of these plants (Kandari et al, 2012). Folk medicine has been frequently utilized in Turi Putih Village, due to the isolated location of this region and socio- economic condition of the people. Therefore, there is a need to conduct a study to record the medicinal plants associated indigenous knowledge in Turi Putih village. Furthermore, no studies of antibacterial activity of medicinal plants from this community have been done.

Diseases caused by bacteria are usually treated with antibiotics. The problems that occur with the use of antibiotics are the side effects and the increasing antibiotic resistance problem (Ningsih et al., 2013). Widespread bacterial resistance to existing drugs encourages researchers to find a new antibiotic from nature. So that the discovery and development of new antimicrobials remains one of the important targets in medicinal plant research. The discovery of new antimicrobial drugs generally

comes from plants. The people of Turi Putih Village have long used medicinal plants to treat infectious diseases, but there has been no scientific research on the antibacterial activity of these medicinal plants, so research is needed to prove that the medicinal plants used by the Turi Putih community have medicinal properties..

Based on this background, there is a need to co0onduct a study to record the medicinal plants associated indigenous knowledge in Turi Putih village to treat infectious diseases caused by bacteria, , and antibacterial tests on two plants that had the highest Use Value (UV) and Fidelity Level (FL) because of plants. which have the highest UV and FL values were the most common and trust in the community in treating diseases caused by bacteria. Therefore, it is necessary to carry out an antibacterial test to determine whether the medicinal plant extract from this community is able to inhibit or kill microbes, i.e *Staphylococcus aureus* and *Escherichia coli*.

The method used for the antimicrobial test in this study is the agar diffusion method or the Kirby-Bauer method using paper discs, where in this technique the agar media that has been inoculated with bacteria is then paper discs was inserted in the media and filled with the test compound. Furthermore, to determine the minimum inhibitory concentration (MIC) and Minimum Bactericidal Concentration (MBC) using the dilution method.

Result from the study were expected to show the significance of local medicinal plant and antibacterial activity of medicinal plants that had high UV and FL scores, because plants. which have the highest UV and FL values were the most common and trust in the community in treating diseases caused by bacteria. It was important to document the uses of medicinal plants within the study area and to provide baseline data for future phytochemical studies, especially to treat infectious diseases caused by bacteria.

Method

Study area

The present study was conducted in Turi Putih Village, Wonodadi District, East java.

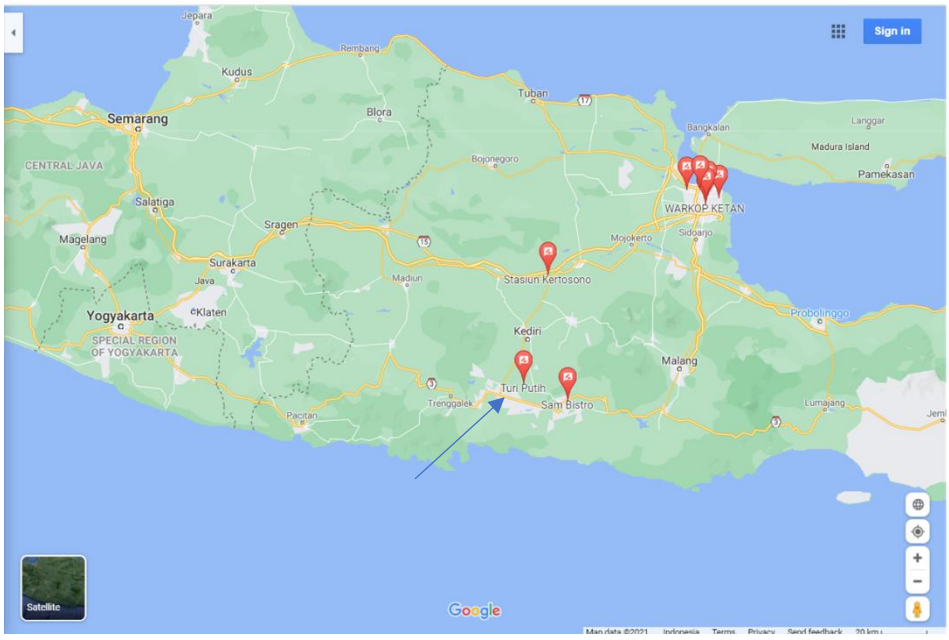

Figure 1. Map of the study area

Data Collection

Field work was carried out from March 2020 to February 2021. A total of 26 (20 females and 6 males) informants were interviewed in the study area, in which all informants were selected purposively and systematically based on recommendation of knowledgeable elders, local authorities. All of informants were local inhabitants. Traditional healers were surely identified as key informants, because they were important custodians and participants of indigenous knowledge of medicinal plants. Interestingly, all these traditional healers were females. A few males were also interviewed to examine their medicinal knowledge and opinions.

Ethnobotanical investigations were carried out to collect data on medicinal plants used to treat infectious diseases caused by bacteria. The methodological approaches were semi-structured interviews, field observation and guided field walks. Information was carefully recorded during interviews with each informant. Field observation were performed with traditional healers guided on the morphological features and and habitats of each medicinal plant species. The information obtained was cross-checked with the other informants. The list medicinal plants were collected from field and gardens.

Data analysis

The ethnobotanical data generated were analysed using quantitative indices, namely Fidelity Level (FL) and Use Value (UV). This helped to establish a consensus on which species are effective to cure diabetes, as well as the species relative importance, and enables us to understand the extent of the potential utilization of each species.

Fidelity Level

FL indicates the percentage of informants claiming the use of a certain plant species for the same major purpose. Fidelity level is calculated by the following formula:

FL (%) = Np/N X 100, where Np is the number of informants that claimed a use of a plant species to treat a particular disease and N is the number of informants that used plants as a medicine to treat any given disease (Friedman et al., 1986).

Use Value (UV)

Use value (UV) demonstrates the relative importance of plants known locally. It was calculated using the following formula (Hoffman and Gallaher, 2007).

$$UV = \frac{\sum Ui}{N}$$

Where Ui is the number of uses mentioned by each informant for a given species and N is the total number of informants.

Selecting medicinal plant species for antibacterial test

Leaves of two medicinal plant species with high UV and FL scores were chosen for antibacterial test against *Staphylococcus aureus* and *Escherichia coli*.

Preparation of the plant extract

The mint and galangal leaves were thoroughly washed with tap water, shade-dried and then chopped into small pieces. Ethanol (70%) was used for extraction for 4 x 24 hours with maceration method. The extract was then concentrated under reduced pressure in rotary evaporator at 45oC and was kept in refrigerator at 4oC before use.

The methods used for testing antimicrobial activity are the disc diffusion method, the determination of minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).

Disc diffusion method

The disc diffusion method used five concentration levels, namely, 30%, 40%, 50%, 60%, and 70%. The bacteria test was evenly rubbed into a petri dish containing MHA medium then a sterile disc paper dripped with 25 µL of mint and kencur leaf extract was placed on the surface of the MHA with 3 replications. Incubation was carried out at 37oC for 24 hours. Sterile disc paper used as negative control and positive control used chloramphenicol antibiotics. The size of inhibition zone is regarded as a measure for antimicrobials potency and measured using the calipers in mm.

Determination of MIC and MBC values by dilution method

The determination of MIC and MBC values were tested using the dilution method with five levels of concentration, namely 30%, 25%, 20%, 15% and 10% extracts of kencur leaves and mint leaves in 5 ml of MHB medium. Test bacteria were inoculated 100 µL into each treatment, then incubated at 37oC for 24 hours. As a negative control, sterile MHB medium was used, while the positive control was added with 25 µg of chloramphenicol into the media. The MIC endpoint is the lowest concentration where no visible growth is seen in the tubes. When 99.9% of the bacterial population is killed at the lowest concentration of an antimicrobial agent, it is termed as MBC endpoint

Statistical analysis

The MBC result was analyzed by ANOVA using descriptive statistics including mean and standard deviation. Tukey's post hoc test was done for the analysis of MBC of mint and galangal leaves against *S. aureus* and *E. coli*. Significance of all the statistical tests was predetermined at $p < .05$.

Results

Medicinal plants reported

The study recorded 44 medicinal plants species (Table1). Ethnomedicinal information for each species, including scientific name, local name, family name, plant part used, preparation and uses, was listed in Table 1. The species belonged to 40 genera and 26 families were used by Turi Putih community to treat various human ailment caused by bacteria. Among the families that contributed more medicinal species were Zingiberaceae, represented by 7 species (15.9%), Euphorbiaceae with 4 (9.0%) species and Acanthaceae and Lamiaceae with 3 (6.8%) species, while other 22 families contributed to 27 (68.3%) species were mostly represented by 1 or 2 species (Table 1).

A total number of twenty-six (26) respondents were interviewed. Most of the respondents were female 20 (77%) and male 6 (23%).

Plant part used and administration

Respondents of the study area used different plant part for preparation of traditional drugs (e.g leaves, fruits, rhizome, stem, seed, sap and tuber). The respondent reported that more species (20) of medicine plant were harvested for their leaves, and these were followed by fruits (11), rhizome (8), stem (4) and other parts (sap, seeds and tuber) (Figure 2). The majority of remedies were prepared from fresh materials, and some were prepared from either dried or fresh materials while a few were only used from dried materials. Most medicinal plants were cultivated in the garden.

Table 1. Inventory of medicinal plants traditionally used by people in Turi Putih Village

No	Scientific name	Local name	Family	Part used	UV	FL (%)	Preparation and use
1	*Acalypha indica* L.	Kalak antong	Euphorbiaceae	Leaf	0.04	3.85	Pound fresh part mixing with lime betel applied on stomach treating for diarrhea.
2	*Allium sativum* L.	Bawang putih	Amaryllidaceae	bulb	0.08	7.69	Chopped, add water; Taken orally for kidney infection, cough
3	*Aloe vera* L.	Lidah buaya	Asphodelaceae	Leaf	0.04	3.85	Medicinal liquor for treating constipation.
4	*Alpinia galanga* (L.) Willd.	Laos	Zingiberaceae.	Rhizome	0.04	3.85	Chopped, boiled; Taken orally for cough.
5	*Alstonia scholaris* (L.) R. Br.	Pulai	Apocynaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally for urinary tractus infection.
6	*Apium graveolens* L.	Seledri	Apiaceae	Leaf	0.04	7.69	Juice; Taken orally for kidney infection.
7	*Averrhoa bilimbi* L.	Belimbing wuluh	Oxalidaceae	Fruit	0.04	15.38	Consumed directly for cough.
8	*Carica papaya* L.	Pepaya	Caricaceae	Fruit	0.04	26.92	Consumed directly for constipation.
9	*Centella asiatica* L.	Pegagan	Apiaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally for meningitis.
10	*Cinnamomum verum* J.Presl.	Kayu manis	Lauraceae	Stem	0.04	3.85	Boiled, decoction; Taken orally for sinusitis.
11	*Citrus aurantifolia* (Christm.) Swingle	Jeruk nipis	Rutaceae	Fruit	0.08	15.38	Juice, add soy sauce; taken orally for cough, sore throat.
12	*Citrus limon* (L.) Burm.f	Jeruk lemon	Rutaceae.	Fruit	0.08	7.69	Juice; Taken orally for cough, constipation.
13	*Clinacanthus nutans* (Burm. f.) Lindau	Belalai gajah	Acanthaceae	Leaf	0.04	3.85	Grinding, decoction; Taken orally for cyst.

Table 1. Inventory of medicinal plants traditionally used by people in Turi Putih Village (continued)

No	Scientific name	Local name	Family	Part used	UV	FL (%)	Preparation and use
14	*Cnidoscolus aconitifolius(*Mill.*)* I.M.Johnst	Pepaya jepang	Euphorbiaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally for typhus.
15	*Cocos nucifera* L.var. viridis	Kelapa hijau	Arecaceae	Endosperm	0.08	7.69	Medicinal liquor for treating kidney infection, gonorrhea.
16	*Curcuma longa* L.	Kunir	Zingiberaceae	Rhizome	0.12	30.77	Shredded, squeezed; Taken orally for typhus., renal infection, tetanus.
17	*Curcuma xanthorrhiza*. Roxb.	Temulawak	Zingiberaceae	Rhizome	0.08	7.69	Boiled with Rhizome of Curcuma longa, add red sugar. Taken orally for diarrhea, cholera.
18	*Cymbopogon citratus* Stapf.	Sereh	Poaceae	Stem	0.04	3.85	Boiled, decoction; Taken orally for cough.
19	*Euphorbia hirta* L.	Patikan kebo	Euphorbiaceae	Leaf	0.04	19.23	Boiled with leaves of *Mentha piperita* add sugar; Taken orally for urinary tract. Infection
20	*Jatropha curcas* L.	Jarak pagar	Euphorbiaceae	Sap, Leaf	0.04	3.85	Pound fresh part applied on the affected areas, treating for wound
21	*Kaempferia galanga* L.	Kencur	Zingiberaceae	Leaf, Rhizome	0.12	34.62	Boiled, decoction; Taken orally for sore throat, cough.

Table 1. Inventory of medicinal plants traditionally used by people in Turi Putih Village (continued)

No	Scientific name	Local name	Family	Part used	UV	FL (%)	Preparation and use
22	*Kaempferia rotunda* L.	Kunir putih	Zingiberaceae	Rhizome	0.12	23,08	Boiled, decoction; Taken orally for diarrhea, typhus, constipation.
23	Manilkara zapota (L.) van Royen	Sawo	Sapotaceae	Fruit	0.04	3.85	Consumed directly for diarrhea
24	*Melia azedarach* L.	Mindi	Meliaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally for lung diseases.
25	*Mentha piperita* L.	Mint	Lamiaceae	Leaf	0.15	46.15	Grinding, decoction; Taken orally for cough, TBC, sore throat.
26	*Morinda citrifolia* L.	Mengkudu	Rubiaceae	Fruit	0.08	34.62	Juice; Taken orally for urinary tractus infection, constipation.
27	*Moringa oleifera* Lam.	Kelor	Moringaceae	Leaf	0.08	3.85	Boiled, decoction; Taken orally for lung diseases, TBC.
28	*Musa paradisiaca* L.	Pisang	Musaceae.	Fruit	0.08	23.08	Consumed directly for diarrhea, constipation.
29	*Orthosiphon aristatus* (Bl.) Miq.	Kumis kucing	Lamiaceae	Leaf	0.12	26.92	Boiled with leaves of *Strobilanthes crispa*; Taken orally for urinary tract. Infection, gonorrhea, syphilis.
30	*Panax ginseng* C.A. Meyer	Ginseng	Araliaceae	Rhizome	0.04	3.85	Grinding, decoction; Taken orally for meningitis.

Table 1. Inventory of medicinal plants traditionally used by people in Turi Putih Village (continued)

No	Scientific name	Local name	Family	Part used	UV	FL (%)	Preparation and use
31	*Paederia foetida* L.	Sembukan	Rubiaceae	Leaf	0.08	7.69	Boiled, decoction; Taken orally for diarrhea, dysentery.
32	*Phyllanthus urinaria* L.	Meniran	Phyllanthaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally for TBC
33	*Piper betle* L.	Sirih	Piperaceae	Leaf	0.08	7.69	Boiled, decoction; Taken orally for cough, lung diseases.
34	*Psidium guajava* L.	Jambu biji	Myrtaceae	Fruit, Leaf	0.08	38.46	Boiled with leaves of *Curcuma longa*; Taken orally for diarrhea, dysentery.
35	*Rotheca serrata (*L.*)* Steane & Mabb.	Senggugu	Lamiaceae	Leaf	0.04	3.85	Boiled, decoction; Taken orally sinusitis.
36	*Ruellia napifera* Zoll. & Moritzi	Gempur batu	Acanthaceae	Leaf	0.04	3.85	Boiled with leaves of *Orthosiphon aristatus*; Taken orally for urinary tractus Infection
37	Salacca zalacca (Gaertn.) Voss.	Salak	Arecaceae	Fruit	0.04	7.69	Consumed directly for diarrhea
38	*Stevia rebaudiana* Bertoni	Stevia	Asteraceae	Leaf	0.08	7.69	Boiled, decoction; Taken orally for TBC, diphtheria.
39	*Strobilanthes crispa* (L.) Blume	Kecibeling	Acanthaceae	Leaf	0.08	15.38	Grinding, boiled with leaves of *Orthosiphon aristatus*; Taken orally for urinary tract. Infection and syphilis.
40	*Tamarindus indica* L.	Asam	Fabaceae	Fruit	0.04	3.85	Boiled, add sugar, decoction; Taken orally for sore throat**.**
41	*Usnea barbata* (L.) Weber ex F. H. Wigg.	Kayu angin	Parmeliaceae	Thalus	0.04	3.85	Boiled, decoction; Taken orally for leprosy.

Table 1. Inventory of medicinal plants traditionally used by people in Turi Putih Village (continued)

No	Scientific name	Local name	Family	Part used	UV	FL (%)	Preparation and use
42	*Zea mays* L.	Jagung	Poaceae	Fruit	0.04	3.85	Boiled with meat and drunk the soup, treating for renal infection.
43	*Zingiber officinale* Roscoe	Jahe	Zingiberaceae	Rhizome	0.08	26.92	Boiled with stem of *Cymbopogon citratus*; Taken orally for bronchitis, sore throat.
44	*Zingiber officinale* var. rubrum Theilade	Jahe merah	Zingiberaceae	Rhizome	0.04	3.85	Grinding, decoction**;** Taken orally for TBC.

The highest number of species 17 (38.6%) was used for the treatment of respiratory problem, like cough, pneumonia, TBC, sore throat, diphteria and bronchitis of all condition. Digestive diseases, like diarrhea, dysentry, constipation, typhus and cholera were treated with 15 species (34%), while Urinary disease, e.g urinary tract infection and kidney infection were treated with 11 species (25%) (Table 2).

Table 2. Diseases group in the study area

Diseases group	number of diseases	number of plants used
Respiratory problem	7	19
Digestive diseases	5	15
Urinary disease	2	11
Meningitis	1	1
Muscle nerve	1	1
Skin infection	1	1
Sexually transmitted disease	2	3

Preparation and route of administration of medicinal plants

The most widely harvested part was the leaves, followed by the fruit, rhizome, stem, sap, seed and tuber. They believed these parts were the most effective. Utilization of leaves might not cause dentrimental effect on the plants compared with plant species that root was utilized. Most of medicinal plants were prepared from a single plant or plant part in the present study, and the different parts of medicinal plant were used to treat disparate disease. People in the community in this study area preferred to treat illness caused by bacteria with single species.

Grinding was the the most widely used method of preparation for remedy in the study area. Pounding and powdering fresh plant materials were the other method of preparation in the study area. The community in the study area used the processing methods such as decoction, consumed directly and external appilcation. For example, sap of *Jatropha curcas* was smeared on the stomach to treat diarrhea.

Use Values

The calculated results of use value (UV) showed that *Mentha piperita* scored the highest number which is 0.15 and *Kaempferia galanga* is 0.12, while *Curcuma longa* and *Kaempferia rotunda* and *Orthosiphon aristatus* (0.12) scored higher use values than other species. Meanwhile, 25 medicinal plant species scored the least use value which is 0.04 (Table 1).

Fidelity Level

The calculation result showed that all have more than 3,85 values (Table 1). Of the result, *Mentha piperita* and *Kaempferia galanga* scored the highest FL values 46,15 and 34,62 respectively.

In Turi Putih community, these two medicinal plants were used to treat infectious diseases caused by bacteria, e.g mint leaves (*Mentha piperita*) was used to treat TBC, cough and sore throat, while galangal leaves (*Kaempferia galanga*) was used to treat cough, sore throat and urinary tract infection. These two medicinal plants were then tested for antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*.

Antibacterial activity using disc diffusion method

The result of the antimicrobial determination of the leaf of *M. piperita* and *K. galanga* against *Staphylococcus* aureus and *Escherichia coli* are investigated in a disc-diffusion assay. The leaf of *M. piperita* and *K. galanga* displayed antibacterial activity (Table 3).

The MIC of *Mentha piperita* and *Kaempferia galanga* that showed antibacterial activity were determinated by macro-dillution method and the result are summarized in Table 4. Ethanolic extract of *Kaempferia galanga* appeared to be more potent than the ethanolic extract of *Mentha piperita.*

The ethanolic extract of *Kaempferia galanga* leaves produces significant activity against *Staphylococcus aureus* (MBC 30%) and against *Escherichia coli* (MBC: 30%) (Table 5).

Table 3. Antibacterial assay of plant extracts by disc diffusion method

Treatment		Target organism Zone inhibition (mm)	
Medicinal plant	Concentration %	*S.aureus* (mm)	*E.coli* (mm)
M. piperita	30	7,47	8,65
	40	9,05	7,47
	50	9,52	8,73
	60	10,00	9,05
	70	9,95	8,72
Control	Positive	31,05	29,03
	Negative	6,00	6,00
K. galanga	30	6,87	8,22
	40	9,57	8,52
	50	10,30	8,20
	60	8,87	9,17
	70	9,63	9,27
Control	Positive	32,27	31,07
	Negative	6,00	6,00

Table 4. MIC of *M. piperita* and *K. galanga*

		Target organism					
		S.aureus			*E.coli*		
Medicinal plant	Concentration %	n1	n2	n3	n1	n2	n3
M. piperita	10	+	+	+	+	+	+
	15	+	+	+	+	+	+
	20	+	+	+	+	+	+
	25	+	+	+	+	+	+
	30	+	+	+	+	+	+
Control	Positive	-	-	-	-	-	-
	Negative	+	+	+	+	+	+
K. galanga	10	+	+	+	+	+	+
	15	+	+	+	+	+	+
	20	+	+	+	+	+	+
	25	+	+	+	+	+	+
	30	-*	-*	-*	-*	-*	-*
Control	Positive	-	-	-	-	-	-
	Negative	+	+	+	+	+	+

Description: (-) = Clear/no bacterial growth
(+) = Turbid/there is bacterial growth

(*) = Proceed to MBC examination

Table 5. MBC of *Kaempferia galanga*

Treatment		Target organism					
		S.aureus			*E.coli*		
Medicinal plant	Concentration %	n1	n2	n3	n1	n2	n3
K. galanga	30	-	-	-	-	-	-

Description: (-) = there is no bacterial growth

Discussion

Plant and plant product have been used extensively throughout history to treat medical problem. The traditional medical method, especially the use of medicinal plants, still play a vital role to cover the basic health needs in the developing countries. Plant continue to be a rich source of therapeutic agents. The active principles of many drugs are found in plant s or are produced as secondary metabolites.

Our result highlight the use of medicinal plants by people from Turi Putih village. A total of 44 medicinal plants species were recorded in the present study. They belong to 26 different families, where Zingiberaceae and Euphorbiaceae were the most representative families. A high number of plant species were used for treating respiratory problem. Leaves were the most popular plant part used and decoction was the most common method of preparation. These findings indicated the potential roles of medicinal plants used in Turi Putih village. People from this community used to treat infectious diseases by medicinal plants without knowing antibacterial activity of these medicinal plants. In this study some antibacterial test was done on medicinal plants they used to treat infectious diseases, only for medicinal plants that had high UV and FL scores.

In this study, two medicinal plants named *Mentha piperita* and *Kaempferia galanga* were chosen for antibacterial test against *Staphylococcus aureus* and *Escherichia coli* because from Ethnobotanical survey of medicinal plants used to treat infectious diseases in Turi Putih village, those two plants had high UV dan FL scores. UV and FL are useful to measure species importance for specific purposes, e,g to treat specific ailment. In this community, *Mentha piperita* are used to treat infectious diseases, such as TBC, cough and sore throat, while *Kaempferia galanga* are used to treat cough, sore throat and urinary tract infections, therefore *M. piperita* and *K. galanga* there demands to be investigated that might yield any antibacterial effect.

Ethanolic extract of *M. piperita* and *K. galanga* exhibit antimicrobial activity against *Staphylococcus aureus* and *Escherichia coli*. Extract from leaf of *K. galanga* appeared to be more potent than that of leaf of *M. piperita*, and produced consistent level of inhibition of bacterial growth. The bioactive compound extracted from leaves of *K. galanga*, i.e essential oil, include kaempferol, kaemferide, eucalyptol and flavonoids (Shing, 2013), this compound will inhibit bacteria growth by destruction of the plasma membrane, enzyme inactivation and denaturation of protein (Haerazi et al., 2020).

Since it was revealed that the leaves extract of *Kaempferia galanga* has the ability to inhibit the growth of *Staphylococcus aureus*,food – poisoning organism (Fetsch and Johler, 2018). Hence, it would be interesting to investigate the potentially of this plant for possible application in foods to promote safety.

Conclusion

A study on medicinal plant utilization in the area revealed that the communities commonly use medicinal plants to treat infectious diseases caused by bacteria. The study resulted in documenting 44 medicinal plant species where Zingiberaceae is the leading family with the highest proportion of medicinal plant. Leaves were found to be the most frequently used plant parts for the preparation of traditional remedies. The result of this study also showed that the leaves extract of *Mentha piperita* and *Kaempferia galanga*, two species that had the highest use value and fidelity level values possess moderate antibacterial activity, and extract from leaf of *K. galanga* appeared to be more potent than that of leaf of *M. piperita*, and produced consistent level of inhibition of bacterial growth. Since it was revealed that the leaves extract of Kaempferia galanga has the ability to inhibit the growth of Staphylococcus aureus – food – poisoning organism, hence, it would be interesting to investigate the potentially of this plant for possible application in foods to promote safety.

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