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INDONESIAN HERBAL SHAMPOO FROM PLANT OIL AS ANTI ECTOPARASITES AGENT FOR HUMANS AND ANIMALS

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ABSTRACT

Background: Indonesian herbal natural source had potentially used in human's and animals' health. Ectoparasite infestation is a crucial public health problem in the world. Efficacy chemical anti ectoparasites agents have lost because lice have resistance developed to them. So, alternative anti ectoparasites agents such as herbal products as essential oil have the potential for treating ectoparasites infestation. **Study design:** To study the efficacy of four plants sirih *(Piper betle),* akar wangi (*Chrysopogon zizanioides),* zaitun *(Olea europaea*), and cinnamon (*Cinnamomum verum*) against head lice and eggs within vivo method. **Methods:** In vivo methods, herbal shampoo and herbal oil formulation lice oil aplication to skin head of the hair while massaged every 3 days. The next day washes with shampoo than combed it serit comb. Study literature to discuss herbal natural source research as an anti-parasites agent in animal used. **Results:** The result of this in vivo test indicated a combination of piper bettle oil, chrysopogon oil, olea oil, and cinnamon oil could kill the lice head and their eggs, effectively for 2 weeks application.

KEYWORDS: Head lice egg, herbal shampoo, chrysopogon oil, piper betlle oil, olea oil, cinnamon oil.

INTRODUCTION

Humans and animals remain a remarkable health threat from infectious diseases. The epidemiology, etiology, and pathology of infectious agents, in the past, in separate studies affecting humans and animals investigated. Combined approaches are needed to understand the transmission and infection biology of zoonotic agents and geographical distribution.[1]

The human lice represent a suitable example of the synergistic benefits from combined approaches: *Pediculus sp*. infects a wide variety of animals, is linked with human diseases. *Pediculus sp* is predestined as a one health concept combining human and veterinary medicine.

An additional factor promoting the spread of these diseases is global warming. The geographic range of some reservoir hosts and vectors expands in response to a changing climate.[2] These challenges respond to interdisciplinary collaborations between medical, veterinary, and environmental researchers in one concept. Public health official's early detection of health hazards affecting both humans and animals. Than to fight them on multiple levels. The head lice represent a prototypical example for zoonotic pathogens for humans and animals. It is important to investigate possible routes of transmission and to combat infections in high pathogen prevalence and severe courses.[1]

In recent times, herbal medicines will be accessible throughout the world. The natural source is alternatives synthetic medicines, with fewer side-effects. These medicinal plants and their phytochemical constituents have potential applications in the management of a wide range of health conditions. Subject pharmacological and clinical research are herbal preparations, herbal extracts, and isolated phytoconstituents. I*n vitro* study demonstrated benefits of the phytochemical constituents do not always translate directly to *in vivo*. Bioavailability, stability, and distribution of herbal medicines, when administered in traditional dosage forms, was inadequate. So the incorporation of herbal medications is the way for research drug delivery systems.[3]

The critical novel drug delivery method is nanotechnology. It is one of under investigation, with nanoformulations thought to have a wide variety of benefits. Conventional preparations of plant constituents, which include enhanced permeability, solubility, bioavailability, therapeutic activity, stability, improved distribution within tissues, and sustained delivery. Nanoformulations are the present review that examines the available research of herbal medicines. Various nanoformulation approaches identified on developed and successfully used the topical delivery of natural bioactive. Highlights review in the development of such novel drug delivery systems need for safety considerations and validated toxicity guidelines.[3]

Biocides plants are relevant sources of natural substances that could be used as alternatives.[4][5] Also, it has been shown that essential oils generally have broad-spectrum effectiveness. However, they were extensively studied because of potential use in agriculture. Their use remains empirical and is not based on a scientific basis. Optimizing techniques for using these plants requires proven scientific knowledge on their physicochemical properties and biological effectiveness.[6] Insecticidal activities can be used for natural plant products because native plants can perform various functions and have essential oils that they produce as a defense against insect pests and disease. The objectives of this study were to determine the efficacy of four essential oils aromatic plants piper betle, chrysopogon, cinnamon, and olea as anti ecporasite agents.

MATERIAL AND METHODS

Extracted plant essential oil

Ingredients containing essential oils were added to in a distilled/distilled container, then moisture will carry essential oils come out of the tissue material. Steam together essential oil is condensed as it passes through the cooling condenser and then dripping/flowing into the container and separate based on differences in specific gravity.

Herbal oil and shampoo preparation

Herbal oil

The materials used in this experiment are lice oil that contains 1000 ml coconut oil, 20 ml chrysopogus oil, 20 ml piper beetle oil, 20 ml cinnamon oil and 20 ml olea oil. All ingredients mixed carefully.

Herbal shampoo

Basic Shampoo ingredient aqua, sodium laureth sulfat, sodium chloride, cocamidopropyl betain, polyquartenium-10, plyquartenium-7, fragnance, propilen glycol, methyl parabean, propil parabean.

Preparation of lice shampoo formulation contains 100 ml basic shampoo, 2.0 ml chrysopogus oil, 2.0 ml cinnamon oil, 2.0 ml piper beetle oil, and 2.0 ml olea oil. All ingredients mixed carefully. Chemical constituents of the plant essensial oil are presented in Table 1, while the formulations used in this study are shown in Table 2.

Table 1: List of plant essential oils tested in this study.

No	Scientific name	Therapeutic property	Chemical constituent	Ref.
1	*Piper betle*	Ulcers wound healing	(*betiephenol*), *seskuiterpen*, starch, *diatase*, *kavikol*	Fanani and Nugroho (2014)
2	*Chrysopogon zizanoidees*	insecticidal, antimicrobial, herbicidal antioxidant	sesquiterpenes sesquiterpenols squiterpenones khusimol, α-vetivone β-vetivone vetivone, zizanal, epizizanal nootkatone	Chahal *et al.* (2015)
3	*Cinnamon verum*	pediculides	benzyl alcohol, cinnamic acid, cinnamyl acetate, 4-hydroxybenzaldehyde salicylaldehyde	Yang *et al.* (2005) Herdwiani et *al.* (2014)
4	*Olea europea*	facial moisturizer, antioxidant	Polivenol flavonoid	Sinta (2018)

Table 2: Formulations of plant essential oil and details.

Formulation	Details
Lice Oil	1000 ml coconut oil +20 ml piper betle oil + 20 ml chrysopogon oil + 20 ml cinnamon oil + 20 ml olea oil
Lice shampoo	1000 ml base shampoo + 20 ml piper betle oil + 20 ml chrysopogon oil + 20mlcinnamon oil + 20ml olea oil
Basic shampoo	Aqua, sodium laureth sulfat, sodium chloride, cocamidopropyl betain, polyquartenium-10, plyquartenium-7, fragnance, propilen glycol, methyl parabean, propil parabean.

Chemical analysis

Preparation sample	Boiled	Test tube

Figure 1: Chemical analysis of lice shampoo formulation.

Saponin

Into the beaker, the sample powder is added as much as 4 grams, then added with 25 mL of ethanol, then boiled for 25 minutes, then filtered in a hot state with cotton put in a vaporizer cup and evaporated carefully. The remaining evaporation is titrated with ether, stirring. Pour immediately into the drip plate, allow to dry. Add a few drops of Liebermann-Burchard reagent. If it appears blue to green indicates the presence of steroids. The insoluble part in ether (vaporizer cup) is added with 10 ml of water and stirred. Part of the solution that occurs is put into the test tube, shake strongly. If the foam is stable, it shows the presence of saponins.

Terpenoid

Into the beaker the sample powder is added as much as 4 grams, then added with 25 mL of ethanol then boiled for 25 minutes, then filtered in a hot state with cotton put in a vaporizer cup and evaporated carefully. The remaining evaporation is titrated with ether, stirring. Pour immediately into the drip plate, allow to dry. Add a few drops of Liebermann-Burchard reagent. If it appears blue to green indicates the presence of steroids. The insoluble part in ether (vaporizer cup) is added with 10 ml of water and stirred. Part of the solution that occurs is put into the test tube, shake strongly. Some are added to the drip plate, then add a few drops of FeCl3 reagent. If there is a black-blue or green-brown color indicates terpenoids.

Flavonoid

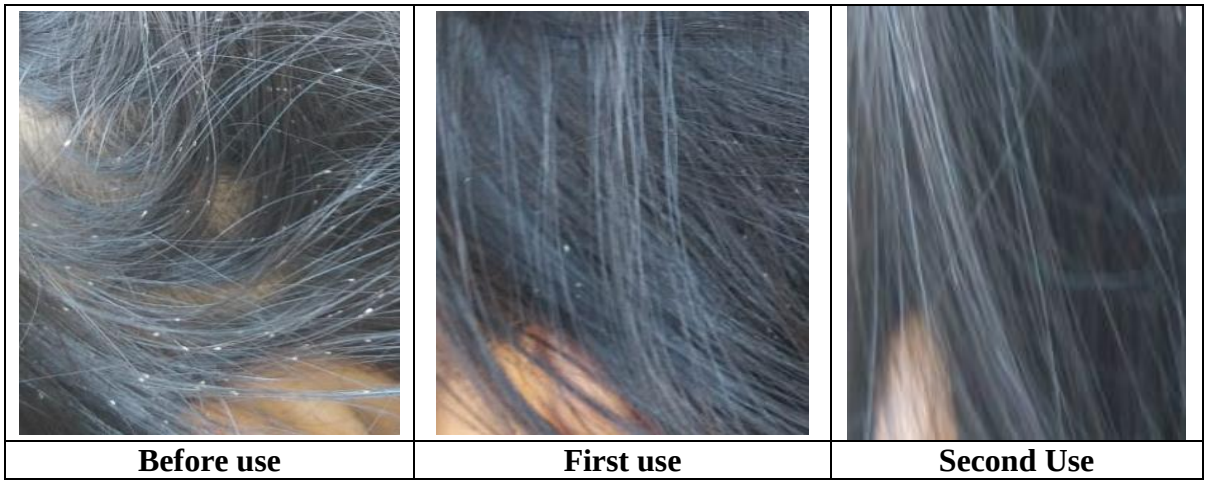
Into the beaker the sample powder is added as much as 4 grams, then added with 20 mL of ethanol-water (9: 1) and then boiled for 25 minutes, then filtered in a hot state with cotton put into a vaporizer cup. Concentrate with direct fire until the volume remains a third. Pipette into the drip plate, then add a little metal Mg and concentrated HCL. Mix well with a stirring rod. If a methyl orange appears, the sample contains flavonoids.

Application for probands

Application shampoo and lice herbal oil used ten probands at 7-9 years old. One hundred ml shampoo used for two weeks. Probands hair comb before sleep, apply lice oil the scalp of the hair until blended, cover with a towel, next morning wash hair with lice shampoo, application of lice oil twice for one week. Using lice shampoo, probands wet the hair with water, remove shampoo from the bottle in the palm of your hand, and rub it all over the hair, rinse thoroughly with water, dry with a towel, comb with lice comb, application of lice shampoo twice for one week, until two weeks.

RESULT

Figure 2 shows girls that infested head lice eggs in the hair. Before used shampoo, many lice eggs in her hair and then first used decreased her lice eggs, and the second used her lice eggs bright. Using shampoo twice a week. And using at two weeks lice and their eggs clear from the hair. It indicated shampoo herbal had potential as an anti ectoparasite agent.



Before use	First use	Second Use

Figure 2: The hair of an infested girl of lice.

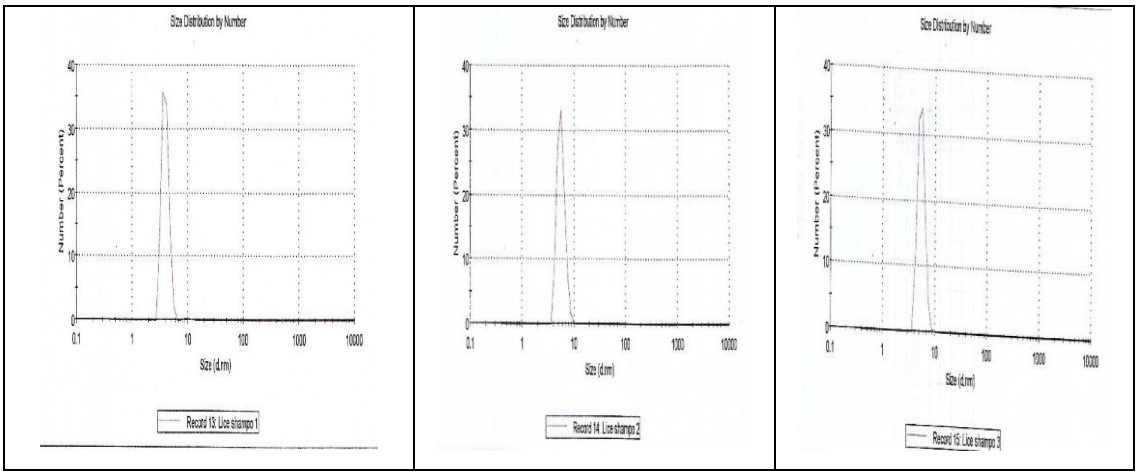


Figure 3. Particle size and viscosity of herbal Shampoo.

The particle size of lice shampoo 5-7 micron or 5000-7000 nanometer, and other specifications see in Table 3.

Table 3: Specification shampoo in this experiment.

	Lice shampoo 1	Lice shampoo 2	Lice shampoo 3
Material RI	1.52	1.52	1.52
Material absorption	0.100	0.100	0.100
Dispersant	Water	Water	Water
Dispersant RI	1.330	1.330	1.330
Viscosity (cP)	0.8872	0.8872	0.8872
Saponin	negative	negative	negative
Terpenoid	negative	negative	negative
Flavonoid	negative	negative	negative

Material RI, material absorption, dispersant, dispersant RI and viscosity tested in pharmacy laboratory, Gadjah Mada University and qualitative test saponin, terpenoid and flavonoid in Muhammadiyah Cirebon University.

DISCUSSION

From the beginning of time, human beings have lived in a symbiotic relationship with plants. Plants provide food, clothing, shelter, fire, smoke, scents, and remedies for healing. Herbal medicine and the use of plant essences for healing, currently undergoing a revival, are not merely fad. Instead, this is an expression of a growing disillusionment with chemical drugs and their many side-effects. We are bestowed with a wide variety of fauna and flora in our country. Selecting herbal medicines means we choose to be helped by nature, of which we are apart. The advocate of all types of healing arts must admit that it is nature that heals. Essential oils are volatile substances obtained from aromatic plants. They contain a large number of medicinal substances, which is why the spectrum of their therapeutic applications is so broad. This article deals with the therapeutic use of essential oils obtained from traditional herbal plants.[7] The essential oils of chemical compositions from the leaves and flowers were determined, also their insecticide activities. The essential oils presented by insecticidal potentials. Further studies are needed for these oils in integrated pest management.[8]

Table 3: List of ectoparasite in animals.

Animals	Ectoparasite	Ref
Chicks	Menacanthus stramineus, Cuclotogaster hetrographus, Goniocoteus gallinae, and Columbicola columbae. Pseudolynchia canariensis 1.4% Dermanyssus gallinae 4.3%. Argas persicus 6.8%	Al Safar (2008)
Birds	*Menacanthus stramineus* 63.6%, *Gniocotes gallinae* 24.2% and soft ticks *Argas persicus* 36.4%.	Hasan (2019)
Pigeons	*Columbicola columbae* 87.5%,and *Argas persicus*	Hasan (2019)

	18.8%.	
Sheep's	Boophilus spp 3.68% and 14.16%, Rhipicephalus sanguineous 12.47% and 28.63%, Rhipicephalus turanicus 7.50% and 15.96%, Hyalomma a. anatolicum 11.90% and 31.30%, Hyalomma marginatum 9.26% and 9.95%) Damalinia ovis 17.74% and Linognathus stenopsis 13.63%, and D. caprae 10.97% and L. stenopsis 6.22% Psarcoptic scabiei 13.83% and Psoroptic ovies 9.98%,	Mustofa (2019)
Camels	*Rhipicephalus spp* (28.95%) *Hyalomma dromedarii* (26.48%), *Dermacentor spp* (18.29%) *H. anatolicum* (12.47%), *H. marginatum* (6.69%), *Ornithodoros spp*. (4.89%) And *Amblyomma variegatum* (2.20%). The *Sarcoptes scabiei var. cameli* (42.22%). *Chrysomyia spp*. (10%) and *Wohlfahrtia magnifica* (16.67%) *Cephalopina titilator* fly (1.11%)	Qomar *et al.* (2018)
Dog	Rhipicephalus sanguineus 40.47% Rh. turanicus 30.95%, Ctenocephalides canis 54.76% Heterodoxsus longitarsus 23.8% Demodex canis 30.95%, Sarcoptes scabiei 19.04% and Cimex spp 7.1% while in guard dogs Hcterodoxsus longitarsus 36.36%, Ct. canis 27.27% Rh. sanguineus 18.18%, Demodex canis 9.09%.	Sulaiman (2006)
Fish	*Zoothamnium* sp., *Trichodina* sp., *Oodinium* sp., *Vorticella* sp., *Argulus* sp., *Lernaea* sp., *Dactylogyrus* sp., and *Gyrodactylus* sp.	Faisal *et al.* (2017)
Rabbits	*Sarcoptes scabiei*	Rahayu *et al.* (2017)

Lice in the chicks

Ectoparasites infesting 280 chicken (native breed outdoor house reared layers, six months – 2 years old), from various regions of Mosul city (poultry market, Hadba' Flock, and six flocks at Kogialli village), for one year. The total percentage of ectoparasites in chickens was 19.3%, of which (54 positive cases out of 280 chicken) 81% were single infections and 19% mixed infections. Lice infestation (12.5 %) and four types of chewing lice were classified. Parasitological findings of skin and feathers examination for all kinds of ectoparasites on chicken showed three degrees of infestation depending on the number of these ectoparasites on each bird (low degree 1–50/ bird, moderate degree 51–100/ bird, and substantial degree more than 100/ bird). Clinical signs of the infected chicken with ectoparasites, especially severe infection were itching, annoyance, loss of sleep, general weakness, loss of appetite, restless, allergy, drop of egg production in layers, and anemia. It clear from results of blood examinations the presence of anemia in infected birds blood-sucking ectoparasites with a significant decrease in PCV %, TRBC, and Hb concentration in chicken, especially in severe

(massively) infestation with soft ticks and mites. Total white blood cells (Leucocytosis) with an increase in heterophils, and eosinophils in infected chicken with ticks, mites, and lice, with lousy nutrition and unhygienic management as compared with the non-infected chicken control group.[9]

Lice in the birds

The study was conducted to detect the ectoparasites infestation in chickens, Domestic pigeons *Columba livia domestica* and turkeys in different areas of Mosul city by survey examining 80 birds of chickens, 85 birds of pigeons and 50 birds of turkeys, of both sexes. Results show the infestation rates with ectoparasites in chickens, pigeons and turkeys, were 41.3%, 37.6%, and 36% respectively. Results show that the chickens were infected with three types of ectoparasites, two species of lice. The highest infestation rate with lice in chicken was 70% in the Spring season and the lowest rate 5% in Summer season while the infestation rates in Autumn and Winter were convergent, there were 44.4% and 45.5% respectively. The infestations were individual and double. In turkeys the results record one lice species *Goniocotes gallinae*; the infestation rates were 36%. The male and female were infested with rates 27.3% and 42.9%, respectively.[10]

Lice in the sheep

The study was carried out through the clinical examination on the skins of sheep and goats to identify the quality and processed in the tanneries. Parasitic skin diseases caused by ectoparasites such as mange mites, lice, and ticks are among these threats resulting in a severe economic loss to the tanning industry and the country as a whole. Out of 38066 sheep and 9889 goats examined in Sulaimani slaughterhouse in spring season 2017, shows statistically significant $P<0.05$ between sheep and goats prevalence; 9.35% and 7.43% respectively with one or more ectoparasites. Three different ectoparasites were infested in both sheep and goats namely; hard tick, lice, and mite. The difference in the prevalence of skin disease infestation between refused skin in both sheep and goats were statistically significant in ruminants ($P<0.05$). This paper deals with major skin defects in occurrence by ectoparasites sheep and goats in Sulaimani province.[11]

Lice in the camels

Camels (*Camelus dromedarius*) were subjected to the external examination of ectoparasites (ticks, mange mites, and flies). The prevalence of Ectoparasites was 55.55%. Their infestations are causing preputial and vaginal and nasal myiasis.[12]

Lice in the dog

Sixty-five dogs from both sexes aged two months – 3years old were used in this study, included 42 stray dogs, 11 guard dogs, six pet dogs, and six clinically healthy dogs served as control were examined. Examination of skin scraping revealed 100%, 45.45%, 16.6% infection with ectoparasites in stray, guard, and pet dogs, respectively. The most important ectoparasites observed. In pet dogs, only Rh. sanguineus 16.6% was recorded. Mixed infection with different endoparasites and ectoparasites was most common in stray and guard dogs 76.19%, 40% respectively. The conclusion was made that the highest percentage of endo and ectoparasites were in stray dogs.[13]

Lice in the fish

Identify the types of ectoparasites that infected the seed goldfish in BBI Kabat, Banyuwangi which the results will be used as an early warning to prevent the death of fish in bulk. The research sample in the form of seeds 3-5 cm carp amounted 150 obtained from BBI Kabat, Banyuwangi. Ectoparasites inspection method performed by scraping the surface of the body, fins, and gills of fish, and then observed under a microscope with a magnification ranging from 40-400x. The observation of ectoparasites is further identified in accordance with morphology based on the keys of identification. Identified ectoparasites infect seed goldfish in BBI Kabat, Banyuwangi consists of 8 genus.[14]

Lice in the rabbits

The purpose of this study was to compare the activity of liniment of coral kelimutu extract and lamtoro leaf extract (*Leucaena leucochepala*) as a scabies healing therapy in rabbits (*Oryctolagus cuniculus*). All rabbit fur were shaved in the anterior dorsal area about 3x3 cm and infested by *Sarcoptes scabiei*. Reduction of scab and the rising number of *Sarcoptes scabiei* death. Coral kelimutu extract is the most effective healing therapy used for scabies in rabbits.[15] The literature study above indicated that using a natural source of *Leucaena leucochepala* as ectoparasite agent. In the future, need using natural source to other animal research as anti ectparasite agent.

Ectoparasite in humans

Ectoparasite in humans begins at era archaeology with study the samples of *Pediculus humanus capitis* nits/eggs between 2000 B.C. and A.D. 500,[16] The human body lice as the vector of human to human-transmission of bacteria. Factors supporting lice infestation is environmental. Unhygienic living conditions lead to an increased risk of infection.[1] The

salivary glands of *Pediculus humanus humanus* has anticoagulance factors. These indicate the presence of both anticoagulant and anti-platelet agents in the salivary gland of the human louse.[17]

Effect herbal oil and shampoo to probands lice

The result of this experiment indicated that the number of ticks is reduced since the first use and is lost on use 6 times or 10 ml oil and 50 ml shampoo for 2 weeks using. At 1 week using, the number of lice and their eggs clear are presented in Figure 3. The other experiment used curcuma oil indicated the same result. Zingiber sp effective against head lice eggs and these essential oils in killing head lice eggs, especially on the inhibition of their hatching process.[18]

Head lice infections are growing on poor hygienic conditions. These infections reduced the quality of life and frequent medical consultations associated with a significantly. Treated with Licener® and visited for two weeks. Successfully treated patients had no relapses. Time to kill the lice and their eggs was the same in this experiment.[19]

Children are affected by an estimated 6 to 12 million by lice annually in the United States. Knowledge of the various treatment options for this diagnosis is essential. Herbal remedies are available to care for the eradication of head lice in pediatric patients.[20]

Essential oils of Citrus hystrix, Citrus reticulata, Zingiber zerumbet, Kaempferia galanga, and Syzygium aromaticum, are potential of essential oils from edible herbs. This herbal could be considered as a potential alternative source for developing novel larvicides.[5]

Indonesian herbal shampoo

Piper betle

In recent years world society including Indonesia tends to consider the use of herbal medicine - back to nature. The advantages of herbal medicine become an interesting discussion. Most information expand in society is empirical rather than scientific evidence.[21] Background one of the medicinal plants used to treat wounds is betel leaf. Betel leaf (*Piper betle*) is also used by Indonesian since the first medication to treat ulcers. However, there is currently no scientific evidence of the effects of betel leaf to accelerate incision wound healing in experimental animals or humans. This study showed that the ointment of betel leaf had the shortest healing times.[22] Later, Ointment betel leaf can be utilized and become a new

therapeutic alternative for wound healing. (*Piper crocatum*) have a decreasing effect for Staphylococcus aureus A TCC 25923 cell surface. The exposure ethanol extract and water extract of red betel vine is not significantly different.[21][23]

Chrysopogon

Vetiver [*Chrysopogon zizanioides* commonly known as akar wangi. Essential of Chrysopogon consisting of sesquiterpenes, sesquiterpenols, and sesquiterpenones. The active compounds are khusimol, α-vetivone, and β-vetivone. Activities of essential oil and its components like vetivone, zizanal, epizizanal and nootkatone as a function of insecticidal, antimicrobial, herbicidal and antioxidant are well known.[24]

Cinnamomum zeylanicum

Cinnamomum zeylanicum essential oil compounds had toxic against eggs and adult females of the human head louse. Their compounds are benzyl alcohol, cinnamic acid, cinnamyl acetate, 4-hydroxybenzaldehyde, and salicylaldehyde, as well as two widely used pediculicides.[25] The present work has addressed the antineoplastic potential of Cinnamon Oil in cancer. This research aims to investigate cytotoxity effect of Cinnamon Oil On colorectal cancer culture cells.[26] *Piper nigrum, Cinnamomum zeylanicum, Cinnamomum cassiaas* identified as strong repellent of *Megalurothrips sjostedti Trybom* is an essential pest of cowpea *Cinnamomum zeylanicum* were highly toxic to the adults and eggs of *P. capitis.*[4]

Olea

According to the hadith Rosulullоh, olive oil is very beneficial for health. Olea can reduce cholesterol, treat hair, prevent osteoporosis, prevent diabetes, and be able to fight cancer, as a facial moisturizer, as an antioxidant, lowers blood pressure. More research on the research of health experts proves this.[27]

Olea has been used as drugs, either in their original or semi-synthetic form. The metabolite secondary can also serve as pharmacological probes, drug precursors, and prototypes. Drug discovery from plants in clinical trials is presented including information on approved drugs and compounds. “Phytomedicines” in clinical trials for the treatment of various diseases is an extract of Olea. New analytical methods to accelerate their future discovery plant-derived compounds will still be an essential aspect of the therapeutic array of medicines available to the physician.[28]

Coconut oil

Coconut is a trendy member of palm family-*Arecaceae.* It is the only accepted species of genus *cocos*. It is also a part of the daily diet of many people. This is a very popular fruit as it has some cultural and religious significance, besides that every piece of this fruit is used in different works.[29] Antibacterial mechanism of mixture between metabolites Lb. plantarum Klik and monoacylglycerol coconut oil was found through analysis of the MIC levels. The level of 1 and 2 MIC can increase the leakages of the gram-positive bacterial cell (L. monocytogenes and B.cereus) and that of the gram-negative bacteria (S. typhimurium). The leakages of cells were measured by spectrophotometer and represented increasing in the absorbance of the protein-nucleic acid. The absorbance of metal ion was evaluated using an AASS (measured by Atomic Absorption Spectrophotometer), and it indicated that the absorbance increased by 40.2% and 22.1% for Ca^{2+} and K^{+} respectively. Observation of cell damage on L. monoctogenes and S. tyhimurium using SEM (scanning Electron Microscopy) resulted in morphological loss on both MIC 1 and 2 in which MIC 2 was severely damaged.[30]

Essential oils from rhizomes have toxicity. *Alpinia conchigera*, *Zingiber zerumbet*, *Curcuma zedoaria*, and their major compounds; camphene, camphor, 1,8-cineole, α-humulene, isoborneol, α-pinene, β-pinene, and terpinen-4-ol was investigated with adults of *Sitophilus zeamais*, *Tribolium castaneum*, *Anisopteromalus calandrae* and *Trichogramma deion* larvae. Extracted essential oils, were tested with *S. zeamais* and *T. castaneum* adults. *Tribolium castaneum* was more susceptible than *S. zeamais* to the eight pure compounds. Terpinen-4-ol was highly toxic to both insects.[31]

Leaf extracts of Himalayan shrubs Timru (and flower extracts of *L. camara* have been tested for their loculicidal and repellency properties against human head louse, *Pediculus humanus captis* (Phthiraptera: Anoplura). The crude extract of these plants was noted very useful in other insects. The mortality rate and repellency were observed 80% and 86.36% in the case of 76.19%, respectively, in *L. camara*. Flower extract of Preliminary results of these plant extracts exhibited loculicidal effects,[32]

Thai herbal shampoos [Cartoxylum formosum (C. formosum) + eucalyptus essential oil (EO), C. formosum + citrus EO, Solanum trilobatum + eucalyptus EO, Solanum trilobatum + citrus EO, Moringa oleifera + eucalyptus EO and Moringa oleifera + citrus EO] for killing all stages of Pediculus humanus capitis (Phthiraptera). A filter paper contact method was applied with

three concentrations (0.05, 0.10 and 0.20 mL/cm2) of each Thai herbal shampoo as well as permethrin pediculicide (positive control) and drinking water (negative control) against eggs, nymphs, and adults of Pediculus humanus capitis. Mortality rates of the eggs were recorded after seven days of incubation, while those of nymphs and adults were recorded after 5 minutes of contact. Results: All herbal shampoos at the high concentration were highly effective against nymphs and adults, but not effective against the eggs. C. formosum + eucalyptus EO and C. formosum + citrus EO shampoos at all concentrations exhibited the highest efficacy against nymphs and adults with 100% mortality rate at 5 min and LC50 values of 0.004 and 0.005 mL/cm2, respectively. All formulation of Solanum trilobatum and Moringa oleifera shampoos added with eucalyptus EO showed mortality rates against nymphs at 92.0%-100.0% and 76.0%-100.0% and against adults at 84.0%-100.0% and 20.0%-32.0%, respectively. Permethrin pediculicide was not effective against the eggs, but showed 68.0%-92.0% and 28.0%-60.0% mortality rates against nymphs and adults. Conclusions: These results indicate that C. formosum + eucalyptus EO shampoo can be used as an effective nymphicide and adulticide against Pediculus humanus capitis.[33]

Flavonoids are found in fruits, vegetables, grains, bark, roots, stems, flowers, tea, and wine. Beneficial effects on health and efforts are being made to isolate. Flavonoids are components in a variety of nutraceutical, pharmaceutical, medicinal, and cosmetic applications. This function as anti-inflammatory, anti-oxidative, anti-mutagenic, anti-carcinogenic properties to modulate key cellular enzyme function.[34] The other side used chemical ektparacitides and ovicidal pediculicide for the topical treatment of head lice.[35]

CONCLUSION

Chrysopogon, olea, cinnamon and piper betle plant had the potential to kill all stages of head lice (eggs, nymphs, and adults) as anti ectoparacyte agents for human and animal.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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