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The toxicity of antiviral plants used in Balinese traditional medicine

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ABSTRACT

The human being all over the world seems to be faced with the increasing of the viral diseases. Herbal medicines which are already used traditionally from generation to generation is subjected to screen for the antiviral purposes. From the available Balinese traditional text of medicine, it is found that there are two viral diseases suspected, namely *tilas* for herpes zoster and *kecacar* for smallpox in modern medicine. There are 29 kinds of medicinal plants described for *tilas*, and more than 70 kinds of plants for *kecacar*. Due to practical reason, only five plants prescribed for herpes zoster analyzed for this study, namely: 1) *Alpinia galanga L.,* 2) *Erythrina lithosperma Miq.,* 3) *Sterculia foetida L.,* 4) *Coriandrum sativa L.,* and 5) *Syzygium cumini L.* Study was focused on the isolation and their toxicities in terms of LD-50. The results found are as follows: 1) Volatile oil was isolated from *Alpinia galangal L.;* 2) alkaloid was isolated from *Erythrina lithosperma Miq.;* 3) flavonoid was isolated from *Sterculia foetida L.;* 4) volatile oil was isolated from *Coriandrum sativum L.;* and 5) tannin was isolated from the *Syzygium cumini L.* Isolation technique used was GC-MS. From the results found, it is concluded: all the plants stated are safe to be used as herbal medicine. For further study is recommended: the antiviral activity testing is a must for the stated plants, either in vivo or in vitro; the similar study needs to conduct for other plants described traditionally for the same diseases.

Keywords: medicinal plants, antiviral, isolation-extraction, LD-50
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INTRODUCTION

Even some of the viral infection or diseases are self-limited, but some others are still dangerous to the human life. It is true for the SARS and HIV/AIDS.[1] The drug for these diseases, still expensive for a villager or at grass root level. Therefore, it is wise, if, in every nation could be screened the local herbal medicine for that. As it is generally accepted, viruses easily change their specificities, by which make the vaccine no longer useful for prevention program.[2]

Even there are antiviral drugs available, but the attempt to find out other antiviral agents still advised to do. In so doing, a cultural approach could be applied. In every nation or ethnicity, the existence of the traditional knowledge and herbal medicine cannot be avoided. That is true for the Balinese, as one part of Indonesian, as a country, the traditional medicine still used by the people, either in the city or in rural area.[3-7]

Why is the traditional medicine still in ue? It is not just a matter of lacking the modern health facilities and the medical staffs. It is due to the culture, the Balinese culture.[6-8] As most the Balinese do believe on Hinduism, they still strongly hold some traditions which are handed down from generation to generation. There are three components by which the traditional medicine is still function in the society.[3,5] The intended components are: firstly, there is a sort of written or spoken material as the sources of the knowledge of the traditional medicine. Secondly, in fact, there is also a provider, namely, the traditional healer in every village in Bali. Thirdly, the consumer, who are going to use the traditional healer' help.

In regards to the antiviral plants, which are used traditionally, it could be searched through the available written materials, which are written on the *lontar* (palm) leaf. As a consequence, if the local plants can be traced to its antiviral action, that must be cheaper in price compared to the existing antiviral drugs.

The research problems are: 1) is there any plant used traditionally for relieving viral infection? 2) in case there are plants used, how far the safety of using them?

In answering the problem encountered, this study was conducted. The goals of the study were: 1) looking at the medicinal plants used for the viral diseases; 2) to point out the toxicity of the intended medicinal plants used traditionally.

MATERIALS AND METHODS

The subject of the study was the antiviral medicinal plants which used traditionally. In doing that there were two steps of activity conducted. The first one,

Table 1 **The traditional textbooks (*lontar*) searched for antiviral medicinal plants**

Lontar name	Number of page	Name of viral disease	Plants prescribed
1. *Usada Darmosada*	8	-	-
2. *Usada Upas*	111	-	-
3. *Usada Tiwang*	37	-	-
4. *Usada Yeh*	14	-	-
5. *Usada Gering Agung*	26	-	-
6. *Usada Edan*	188	-	-
7. *Usada ceraken tingkeb*	39	-	-
8. *Usada Anda kecacar*	39	*Kecacar*	70 plants
9. *Usada Mala*	7	-	-
10. *Usada kuranta bolong*	30	-	-
11. *Usada Bebahi*	152	-	-
12. *Usada Ratuning usada*	51	-	-
13. Usada Semaratura	43	-	-
14. *Usada Cukil Daki*	49	-	-
15. *Usada Lara kamatus*	19	-	-
16. *Usada Taru Premana*	26	*Tilas*	3 plants
17. *Usada Dalem*	33	*Tilas*	7 plants
18. Usada Dalem Jawi	*78*	*Tilas*	4 plants
19. *Usada Kalimosada*	7	*Tilas*	12 plants
20. *Usada Gelagah Puwun*	62	-	-

searching the viral diseases, in the written sources of traditional textbooks (*lontar*). There were 20 traditional textbooks of medicine were searched. It was also intended to find out what kind of plants prescribed for the treatment of the said diseases. The second step was the laboratory works, isolation or extraction of the active component from the plants used. The isolation and or extraction were done at the Chemical Department of the Faculty of Mathematical and Natural Sciences, Udayana University. The GC-MS technique was applied. After finding the active components, then toxicity testing was also done using LD-50 at the Department of Pharmacology, Faculty of Medicine, Udayana University.

RESULTS

The diseases caused by virus

From the 20 traditional Balinese textbooks of medicine, it is found the name of viral diseases only in 5 sources.The diseases which caused by virus are *tilas* and *kecacar*. *Tilas* is a skin disease which is identical to herpes zoster in modern medicine; *kecacar* is the traditional name for smallpox. Both diseases are surely caused by the virus. The name of Balinese traditional textbooks of medicine searched is presented in Table 1.

Name of plants prescribed for both diseases is depicted in Table 2. There are 29 kind of plants prescribed for herpes zoster. For this article, the medicinal plants prescribed for the smallpox are not reported.

Laboratory works

Isolation and extraction conducted at the Chemical Laboratory, Faculty of Mathematic and Natural Sciences, Udayana University, Denpasar Bali. Due to limited budget, available, only five plants were subjected to isolation and extraction. The results for them are presented in Table 3.

Toxicity

For the toxicity testing which was assessed from the LD-50, the results found are presented in Table 4. The LD-50 of the stated plants found are as follows: 1) *Alpinia galangal L.* 20.0 g/kg body weight; ranged from 13.41-29.84 g/kg body weight; 2) *Erythrina lithosperma Miq.* 9.83 g/kg body weight, ranged from 8.21-11.77 g/kg body weight; 3) *Sterculia foetida L.* 20.1 g/kg body weight, ranged from 13.4-29.8 g/kg body weight; 4) *Coriandrum sativum L.* 5,062 ml/kg body weight, ranged from 4,005.8-6,397.64 ml/kg body weight; 5) *Syzygium cumini L.* 16.87 g/kg body weight, ranged from 13.35-21.33 g/ kg body weight.

DISCUSSION

The word virus does not exist in the Balinese vocabulary.[9-11] Therefore, it is a little bit difficult to search the viral disease in the Balinese traditional textbooks of medicine.

Based on the first author's experience when doing intensive research at The Department of Neurology in the hospital, it was found that the manifestation of herpes zoster in a human being is traditionally called *tilas*. While the smallpox infection is called *kecacar*. It is generally accepted in modern medicine that both of the said diseases are caused by the virus.[1,2]

By then, it was searched in the traditional textbooks of medicine which are written in the palm leaf (*lontar*) for these two diseases. Amongst the 20 *lontar*s searched, it is found the both diseases just only written in five *lontars,* as presented in Table 1. The recommended herbs use in a prescription for the treatment of these two diseases, as depicted in Table 2. There are 29 medicinal plants prescribed for the *tilas* or herpes zoster, as presented in Table 2.

For the isolation and extraction of the stated medicinal plants only the top-five plants available

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Table 2 Name of plants, prescribed traditionally in Balifor viral infection

Local name	Indonesia name	Scientific name
1. Adas	Adas	*Foeniculum vulgare Mill*
2. Bawang	Bawang	*Allium ascalonicum L*
3. Cenana	Cendana	*Santalum album L.*
4. Dapdap	Dedap	*Erythrina lithosperma Miq*
5. Gamongan kedis	Lengkuas	*Zingiber cassumianar Sp.*
6. Isen	Lengkuas	*Alpinia galanga L.*
7. Jangu	Deringo	*Acoms calanus L.*
8. Juwet	Jamblang	*Eugenia cumini Merr*
9. Kangkang yuyu	Kangkang yuyu	*Ipomoea sp.*
10. Kayu santen	Kayu santen	*Lannea grandis Engl.*
11. Kayu musi	?	*?*
12. Kesuna	Dasun	*Allium sativum L.*
13. Kecemcem	Kecemcem	*Spondias piñata L.*
14. Kepinis	Gempinis	*Melia azadarach L.*
15. Kepuh	Randu	*Sterculia foetida L.*
16. Ketumbah	Ketumbar	*Coriandrum sativum L.*
17. Kem	Rukam	*Flacourtia rukam Z et M*
18. Kutat kedis	Kutat	*Planchonia valida Bl*
19. Komak putih	Koro putih	*Dolicus lablab L.*
20. Lempeni	Lempeni	*Ardisia elliptica Thumb.*
21. Nyambu putih	Jambu putih	*Syzygium zolingerianum Mig.*
22. Nyuh	Kelapa	*Cocos nucifera L.*
23. Peron	Peron	*Anamirta cocculus W et A*
24. Paku lelipi	Pakis ular	*Pleopeltis phymatodes MOORE*
25. Pisang saba	Pisang saba	*Musa paradisiacal L.*
26. Pisang ketip	Pisang ketip	*Musa paradisiacal L*
27. Isinrong	Rempah-rempah	*?*
28. Sintok	Sintok	*Cinnamomum sintok Bl.*
29. Wong kilap	Jamur	*?*

Table 3 The results of isolation and extraction of the top-five stated medicinal plants prescribed for viral infection

Indonesian name	Scientific name	The active component
1. Lengkuas	*Alpinia galangal L.*	Volatile oil
2. Dedap	*Erythrina lithosperma Miq.*	Alkaloid
3. Randu	*Sterculia foetida L.*	Flavonoid
4. Ketumbar	*Coriandrum sativum L.*	Volatile oil
5. Jamblang	*Eugenia cumini Merr.*	Tannin

due to a financial matter. The result, are presented in Table 3.

In fact, the usage of the stated medicinal plants is the fresh one, either in the form of leaves, flowers, fruits, roots, or stems. Another thing found that the prescription has never used only one medicinal plant. Usually, it is prescribed three or four raw materials to be combined for treatment. Therefore, it is rather difficult to interpret, what component is the active one for the viruses.

Another problem in the isolating and extracting the medicinal plants is much affected by the technique and the solvent used. Other technique and other solvent used to give different substance.[12] There are four active components found from five medicinal plants, namely volatile oils extracted from *Alpinia galanga* and *Coriandrum sativum*, an alkaloid from *Erythrine lithosperma*, flavonoid from *Sterculia foetida*, and tannin from *Eugenia cumini*.

For their toxicities, which was assessed by the LD-50, it was found that the mean dosages vary for the active components. The same thing also for the minimum dosages till the maximum dosages are varied. The mean dosages are 20.0 g/kg for the volatile oil; 5,062 ml/kg for the alkaloid, 9.8 g/ kg for the flavonoid, and 16.8 g/kg for the tannin.

From the results, it could be interpreted that based on the means and the range values, all the active components are safe to be used for medication. The means for their LD-50 are quite high; therefore, the said medicinal plants are not categorized into a toxic plant. That might be the reason, why the said plants are used for treating the diseases till now. The true evidence should be based on the result of appropriate research in vivo or in vitro.

In facts, it is considered also that *Alpinia galanga L* and *Coriandrum sativum L.* are used in Bali as a food ingredient[13] as a source for spices used daily. We do not know exactly if the medicinal plants are also used as a food ingredient, whether its efficacy for treating the diseases will be affected. Another example is *Eugenia cumini*, the fruit used to be consumed freshly, due to its sweet taste.

From the discussion, the following conclusions could be drawn: 1) there are two diseases which are suspected caused by viral infection, namely *tilas* and *kecacar* mentioned in this research; 2) there are 29 kinds of medicinal plants described for *tilas* disease; 3) medicinal plants for treating *kecacar*is not reported here; 4) the active components isolated are volatile oil from the *Coriandrum sativa L.* and *Alpinia galanga L*; flavonoid from the *Sterculia foetida L.*; alkaloid from *Erythrina lithosperma Miq.* and tannin from *Syzygium cumini L.*; 5) all the plants mentioned are safe to be used as herbal medicine.

For further study is recommended: 1) the antiviral activity testing is a must for the stated plants, either in vivo or in vitro; 2) the similar study needs to conduct for other plants described traditionally for the same diseases.

Table 4 **The LD-50 from five plants prescribed traditionally for viral infection in Bali**

Plant name	Active component	Mean of LD-50	Range of LD-50
Alpinia galangaL.	Volatile oil	20.0 g/kg bw	13.4 -29.8 g/kg bw
Erythrina lithosperma Miq.	Alkaloid	5062 ml/kg bw	4005.8-6397.6 ml kg bw
Sterculia foetida L.	Flavonoid	9.8 g/kg bw	8.2 – 11.7 g/kg bw
Coriandrum sativum L.	Volatile oil	20.1 g/kg bw	13.4 -29.8 g/kg bw
Eugenia cumini Merr.	Tannin	16.8 g/kg bw	13.3 -21.3 g/kg bw

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