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Validation of tribal claims on *Dioscorea oppositifolia*: A birth control agent

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ABSTRACT

Dioscorea species is used for curing various diseases and ailments in different regions of the world. The leaves of *Dioscorea oppositifolia* L. is used as food and medicines among different ethnic groups of India. The leaves and tubers are specially used as a birth control agent. Presently, the use of chemically synthesized pills for birth control promotes many diseases and disorders. So, the present study deals with herbal products from *D. oppositifolia*. The plant was collected from the village near of Derras Dam, Odisha and the leaves were dried and powdered for further screening. In order to establish and confirm tribal claims, methanol extract was subjected to phytochemical analysis of bioactive compounds. The analysis of phytochemical screening of the leaf extract showed positive results for the presence of Saponin. The result establish the tribal claims on *D. oppositifolia* as birth control agent.

INTRODUCTION

The use of natural products with therapeutic properties by common people is as ancient as human civilization and for long, plant products were the main source of traditional medicines (Ji et al. 2009; Kumar et al. 2018). The industrial revolution and the development of organic chemistry resulted in preference for

synthetic products for pharmacological treatment (Rats 2001; Kwik 2015). The history of birth control also known as contraception and fertility control, which used different methods or devices that have been historically used to prevent pregnancy. From 1550 BC to 1550 BC, people used honey and *acacia* leaves to be placed in the vagina to block sperm (Lipsey et al. 2005; Cuomo et al. 2010). In Kahun, Gynecological Papyrus from about 1850 BC, it describes various contraceptive pessaries, include the application of gummy substances to cover the "Mouth of the womb", a mixture of honey and sodium carbonate applied to the inside of the vagina and a pessary is made from crocodile dung (Lipsey et al. 2005). These are various modes and chemically synthesized drugs that are used to check pregnancy. They create different types of side effects. Hence need a herbal product for safe intake of herbal drug. Keeping the side effect in view, *D. oppositifolia* has selected for the experimental work. *Dioscorea* is a genius of over 600 species of flowering plants in the family Dioscoreaceae. The vast majority of the species are tropical with only a few species extending into temperate climates (Govaerts et al. 2007; Wilkin et al. 2009).These are tuberous herbaceous perennial lianas growing to 2-12 meters or more tall. The leaves are spirally arranged, mostly broad heart shaped and flowers are individually inconspicuous, greenish yellow with six petals. The fruit is a capsule in most species, a soft berry in a few species among them, *D. oppositifolia* is a type of yam native to Myanmar and to Indian subcontinents (Samanta et al. 2006; Goverts et al. 2007). *D. oppositifolia* is selected as per their ethnic uses as birth control agent. The present study highlights the importance in mitigating side effects of chemically synthesized birth control pills.

METHODOLOGY

Selection, Identification and enumeration of selected experimental plant species in study area

The experimental plant, *D. oppositifolia* was collected as per availability in Odisha. The selection was based on ethnomedicinal values. The selected plant species was characterized using morphological characteristics and identified by Dr. Sanjeet Kumar, APRF, Odisha, India.

Collection of experimental plant species

The samples were collected near a village of Derras Dam, Odisha. The leaf samples were kept in polybags tagged with botanical names. Then they were sorted out as per standard sampling process. Samples were preserved as voucher specimens and were deposited in the herbarium of Ambika Prasad Research Foundation (APRF), Bhubaneswar.

Extraction and detection of bioactive compounds

As per polarity index, two solvents (aqueous and methanol) were selected for extraction. Extraction was done using Soxhlet apparatus. The powder of leaves was poured in the thimble at the ratio of 20 g per 250 ml of solvent at the temperature of 60°C (methanol) and 100°C (aqueous). Collected residue was then dried at room temperature. Qualitative detection of the bioactive compounds was done on n-hexane, acetone, methanol and aqueous extract of leaves (Kumar et al. 2013).

Plate 1: Collection and extraction of experimental plant; A) *D. oppositifolia*; B: Leaves powder; C) Extraction

Plate 2: Field work, Collection and awareness programme on medicinal plants, A-B) Field work; C) Identification of plant; D) Awareness programme cum data collection on medicinal plants

RESULTS AND DISCUSSION

There are lots of commercially synthesized birth control pills available in market. They have side effects and create a lot of health problems. The herbal products have no or less side effects. The results show that the tribal communities use *D. oppositifolia* with other tuberous plant as birth control agent (Table 1). They also use the leaf of *D. oppositifolia* to treat snake bite, scorpion sting and as birth control agent with other tuberous plants (Kumar and Jena 2017). From the qualitative analysis of bioactive plants we came to know that from aqueous extract of leaves Tannin, Saponin and Phenolic compounds are detected. It was noted that in Acetone extract of leaves, Tannin, Phenolic compounds, Terpenoids and Flavanoids are detected. It was observed that in Chloroform extract of leaves, no bioactive compounds are detected. Methanol extract of leaves showed Saponin, Terpenoids, Tannins and Phenolic compounds (Table 2). As Saponin is present in aqueous extract of the *D oppositifolia* leaves, it might be responsible for curing skin infections and due to the presence of Diosgenin which is a naturally occurring steroid *i.e* Saponin, it has been used as a contraceptive agent (Table 3). In 2008, Fragoso et al. documented some plants having anti-fertility properties like *Afrormosia laxiflora, Pterocarpus erinaceus, Michelia champaca* and *Striga orobanchioides*. Other literature also revealed that the some plants having contraceptive, abortive and antifertility activity are recorded, like *Aegle marmelos, Cuminum cyminum, Foeniculum vulgare, Moringa olerifera, Piper nigrum, Sesbania sesban* and *Solanum xanthocarpum* (Kadam et al. 2015). It was observed that rhizomes of *Trillium govanianum* are rich source of steroids which can be hydrolysed to obtain diosgenin and has antifertility effects (Sharma et al. 2016). Anti-fertility effects of *Bougainvillea spectabilis* or Paper flower is also reported by Ghogar & Wannee (2017). The alcoholic extract of Hibiscus flower exhibit inhibition of pregnancy too (Nivsarkar et al. 2005; Nayaka et al. 2014).

Table 1: Ethnomedicinal values of *D. oppositifolia* among the locals of Khordha, Odisha

Plant part	Collection site	Medicinal uses	Mode of uses	Other uses
Leaves	Derras Dam, Odisha	Used against snake bite	Leaf juice used to treat snake bite & scorpion string.	Edible

Table 2: Qualitative analysis of bioactive compounds of *D. oppositifolia*

Plant part	Solvent used	Bioactive compound detected
Leaves	Aqueous	Tannin, Saponin and Phenolic compounds
	Acetone	Tannin, Phenolic compounds, Terpenoids and Flavanoids
	Chloroform	No bioactive compounds detected
	Methanol	Saponin,Terpenoids, Tannin and Phenolic compounds

Table 3: Correlation of tribal claims with bioactive compound

Plant part	Tribal claims	Correlation with bioactive compounds
Leaves	Skin infections	Saponin is present in the aqueous extract of *D. oppositifolia* and responsible for curing skin diseases.
	Contraceptive	Due to the presence of Diogenin which is a naturally occurring steroid saponin. It has been used traditionally as a contraceptive method.

CONCLUSION

The aqueous extract of the leaves contain saponin that means the leaves might contain Diosgenin. Diosgenin, a type of saponin is an identified compound in *Dioscorea* species. Diosgenin is a precursor of steroidal drugs that are available in the market but synthetic chemical drugs are prone to side effects or user discomfort. Herbal contraceptives are not as much effective as pills but can be used as an alternative with lower side effect. The herbal contraceptive methods offer alternative for women who have problems with or lack of access to modern contraceptives options. The present study do not recommend to take any type of drugs (herbals or chemically synthesized) for abortion, it only highlights the importance of herbal drugs.

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