Trop J Nat Prod Res, August 2023; 7(8):3643-3646 ISSN 2616-0684 (Print)
ISSN 2616-0692 (Electronic)

Tropical Journal of Natural Product Research

Available online at https://www.tjnpr.org

Short Communication

Lactagogue Activity of Aqueous Extract of Javanese Ginseng Leaves on Wistar Mice

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ARTICLE INFO

Article history:
Received 14 May 2023
Revised 29 July 2023
Accepted 03 August 2023
Published online 01 September 2023

ABSTRACT

The plant known as Javanese ginseng (*Talinum paniculatum* Gaertn) contains polyphenols, steroids, flavonoids, and other chemical substances that can enhance breast milk production by stimulating the mammary glands to make more milk. This study aims to investigate the potential of Javanese ginseng leaves to induce milk production in adult mother mice. The infusion technique was used to extract the ginseng leaves. The amount of breast milk reflected by the mice's weight before and after breastfeeding is used to calculate the possibility of increasing breast milk. The 25 mother mice used in this study were separated into five groups, including the normal control group (which received NA-CMC 0.5%), the positive control group (which received a commercial breastfeeding promoter including katuk plants at a dose of 117 mg/kg BW), and group D1 (which received a 5000 mg/kg BW infusion of Javanese ginseng leaves), group D2 (which received a 2500 mg/kg BW infusion of Javanese ginseng leaves), and group D3 (which received a 1250 mg/kg BW infusion of Javanese ginseng leaves). The results showed that mother mice that received Javanese ginseng leaf infusion produced more breast milk than the normal controls. Mother mice given 5000 mg/kg of Javanese ginseng leaf infusion showed the highest percentage (13%) increase in breast milk production. However, its capacity to do so was less than commercial breast milk-promoting products, with a 26% increase in breast milk production. We conclude that Javanese ginseng leaf extract used by breastfeeding mothers could enhance breast milk production.

Keywords: Javanese ginseng leaf, infusion extract, lactagogue, Breast milk production

Introduction

Mother's milk (ASI) is the best food and source of nutrition for babies. Breast milk is ideal for child growth and development, improving health and preventing disease. However, not all babies can get the milk they need because little or no milk comes out.[1] According to research conducted by[2], contraceptives containing the hormone estrogen and passive smoking can significantly influence the smoothness of breast milk because it interferes with the hormones prolactin and oxytocin for milk production. In addition, other factors can affect the smooth flow of breast milk, including baby suction, stress, lack of rest, and nutrition.[3] The community's efforts to enhance milk production involve using inexpensive, non-toxic plant components readily available in and near their houses. Javanese Ginseng is one of the herbs that people use as medicine to boost milk production.[4]

Javanese ginseng (*Talinum paniculatum* Gaertn) is a succulent plant that originates from Indonesia.[5] Javanese Ginseng plants can be easily propagated and sometimes cultivated in pots and community gardens. Ginseng is an adaptogen; it provides overall balance by increasing the body's ability to heal.[6] The parts of the Javanese ginseng plant that can be used as medicine are the roots and leaves. Ginseng leaves can be used to increase milk production and appetite, as an ulcer medicine, and as an aphrodisiac (strong medicine).[7]

According to research,[8] Javanese ginseng leaves contain flavonoids, saponins, tannins, alkaloids, and quinones.

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Citation: Riasari H, Fauzi NI, Wibowo DP, Dayana MD. Lactagogue Activity of Aqueous Extract of Javanese Ginseng Leaves on Wistar Mice. Trop J Nat Prod Res. 2023; 7(6):3643-3646 http://www.doi.org/10.26538/tjnpr/v7i8.11

Official Journal of Natural Product Research Group, Faculty of Pharmacy, University of Benin, Benin City, Nigeria

Phytochemical components such as polyphenols, saponins, tannins, and alkaloids have been shown to increase milk production, protein concentration, and ovulation rate, increase protein digestion and help to increase milk secretion.[9] Most of the phenolic and flavonoid compounds have phytoestrogen activity which can trigger the secretion of the hormone prolactin and cells in the mammary glands, thereby increasing casein production and lactose synthesis.[10] This is in line with research conducted by [11] that show that the administration of routine compounds from the flavonoid group can increase the release of prolactin (PRL) and growth hormone (GH). The literature search revealed scanty information on the benefits of using Javanese Ginseng leaves to increase breast milk production. This study aims to investigate the potential of Javanese ginseng leaves to induce milk production in adult mother mice.

Material and Methods

Plant materials

Java ginseng leaves (*Talinum paniculatum* Gaertn.) were collected from Kutawaringin, Soreang Kabupaten Bandung, Indonesia, in November 2020. Javanese ginseng (*Talinum paniculatum* Gaertn.) was identified at the Plant Herbarium Jatinangor Taxonomy Laboratory, Department of Biology, Faculty of Mathematics and Natural Sciences, Padjadjaran University, Jatinangor, and a voucher number: No.48/HB/04/2021 was assigned. The plant leaves were sorted, washed, chopped into smaller pieces and dried under shade for two weeks. All extraneous materials, e.g. pollens, were removed. The raw material was then standardized using specific and non-specific characterization methods based on the standard procedure described in Indonesian Herbs Pharmacopoeia.[12] The crude extract of the plant was subjected to phytochemical screening to determine the presence of secondary metabolite using standard procedures.[13,14]

Animals

Ethical approval was obtained from The Padjadjaran University Ethics Committee, with approval number 685/UN6.KEP/EC/2021. Adult female Wistar mice (25) 2 months old, weighing 25-40 grams, were

used for this study. The animals were kept in clean plastic cages and had access to rodent feed (Biopharma) and water *ad libitum*. The OECD guidelines for the care of experimental animals were followed.

Preparation of plant material
Javanese Ginseng Leaf Infusion
Treatment group D1 infusion extract was made by weighing 20 g of simplicia powder, moistened with 40 mL of distilled water. After that, 100 mL of distilled water was added and heated to 90℃ and then allowed to extract for 15 minutes. After that, the simplicia was filtered while hot and made up to a volume with 100 mL water. For group D2, the D1 infusion was diluted with 50 mL of distilled water. The same thing was done for group D3 where 50 mL of D2 infusion was taken and diluted with 50 mL of distilled water. The infusion extract was made fresh every 3 days before use and was protected from microbial contamination.

Phytochemical screening
The dried Javanese ginseng leaf extract infusion was used to test for the presence of alkaloids, flavonoids, tannins, phenolics, triterpenoids, steroids, quinones, monoterpenes, sesquiterpenes, and saponins.[13,14]

Mating of mice
Male and female mice were placed in the same cage in a ratio of 1:3 and had free access to water and rodent feed during mating. After this, the male mice were removed from the cage to prevent disturbing pregnant female mice about to give birth. The mice were moved into individual cages after 15 days of gestation, each housing a single mouse.[15]

Increase Milk Production Activity Test on Mother Mice
Twenty-five parent mice (*Mus musculus*) were employed, divided into five groups with five mice each. A 5% solution of Na-CMC was used as the standard control group. The positive control group received a commercial breast milk enhancer containing 300 mg/kg BW of katuk leaf extract and 0.02 mg of vitamin B12 solubilized with 5% Na-CMC and administered as a suspension. Different doses (Group D1 received 5000 mg/kg BW, Group D2 received 2500 mg/kg BW, and Group D3 received 1250 mg/kg BW) of the Javanese ginseng leaf extract were administered by an oral gastric tube to the test groups on the second day of postpartum and continued for 13 days. The body weights of the experimental animals were taken on days four through fourteen. Before breastfeeding, the infants were weighed and reassembled with the mother for two hours. After eating, the mouse group's weight was measured once more. The difference between the mice's body weights before and after feeding was used to calculate the amount of milk produced.

Statistical analysis
Results were expressed as mean±SD. Differences between groups were analyzed with a one-way analysis of variance (ANOVA).[16,17] $p<0.05$ was considered significant.

Result and Discussion

Standardization of Crude Drug
Simplicia was characterized to establish a consistent form. Previous studies showed that the sample has a high percentage of water-soluble secondary metabolites and was thus extracted by water infusion. It was also reported that 15% of the leaves from Javanese ginseng were lost during drying, which indicates that a significant amount of the phytoconstituents, water, essential oils, and other volatile components are lost during the drying process.[18] The water content test provides information on the plant material water content. As a standard requirement, simplicia must contain no more than 10% water because a higher percentage of water content leads to biodegradation of the crude drug and fungal growth. The water content test findings revealed that the ginseng leaf Simplicia has a 10% water content. The total ash content in a plant sample indicates the amount of mineral content in that sample. The result of the ash content obtained in this study was 18% (Table 1).

Mice Milk Production
The level of milk production by the lactating mice was investigated by isolating the baby mice from their moms for 6 hours, weighing them before feeding, and then again after 2 hours of breastfeeding. This method makes it possible to determine how much milk the mother mice produce. The six-hour separation is intended to induce hunger in the breastfeeding mice and then fed again with milk after two hours.[19]
Java ginseng leaf extract was administered on day two post-delivery to reduce tension during therapy, while weighing was done on the fourth day after delivery. This was done to prevent the babies from being cannibalized by their mothers following separation. There were 8 to 12 baby mice born in every litter. To avoid errors, the number of children picked from each group was equalized, with 8 children per brood, independent of sex, because the number of suckles impacts milk production. The research was carried out until the 14th day postpartum because on the 15th day, the mice, apart from drinking mother's milk, also started eating solid food (pellets), which could cause a bias in the study.[19]
Results of the study (Figure 1) showed that the positive control group's milk production increased by 26% compared to the standard control. However, group D1-D3 animals which received different doses of Javanese ginseng leaf infusion showed increases of 13%, 4%, and 1%, respectively, compared to the standard control. The increase in milk production in the experimental animals may have been due to secondary plant metabolites in the Javanese ginseng leaf infusion. From the results obtained, it is possible to postulate that the concentration of the extract given positively correlates with the concentration of secondary metabolites. The induction of milk production by the extracts is dose-dependent. The flavonoids, saponins, and steroids found in Javanese ginseng leaves can influence how much prolactin and oxytocin are released. These substances serve as galactagogues, which are substances that aid in starting, launching, and boosting milk production. Most galactagogues stimulate the anterior pituitary gland to produce more prolactin and aid in its release. The prolactin inhibitory factor, a secretion from the hypothalamus gland that stimulates prolactin-releasing hormone, is suppressed by this compound's direct activation of the pituitary gland.

Table 1: Results of Simplicia Characterization of Javanese Ginseng Leaves

Characterization	Result ± SD
Loss on drying	15% ± 0.75
Total Ash Content	18% ± 0.97
Water Content	10% ± 0.24
Ethanol soluble material	12% ± 0.53
Water soluble material	32% ± 0.57

Table 2: Daily Production and Total Milk Production

Treatment Group	Milk Production (g)	
	Daily	Total
NC	1.13 ± 0.05^{c}	12.38 ± 0.65^{c}
PC	1.42 ± 0.07^{a}	15.64 ± 0.84^{a}
D1	1.27 ± 0.06^{b}	14.02 ± 0.26^{b}
D2	1.17 ± 0.05^{c}	12.88 ± 0.50^{c}
D3	1.14 ± 0.04^{c}	12.55 ± 0.52^{c}

NOTE: NC= Negative Control
PC= Positive Control
D1= Dose 1 (5000 mg/kg BW)
D2= Dose2 (2500 mg/kg BW)
D3= Dose3 (1250 mg/kg BW)
Values are mean±SD, (n=11) a>b>c, same letters in the same column = not significantly different ($p>0.05$)

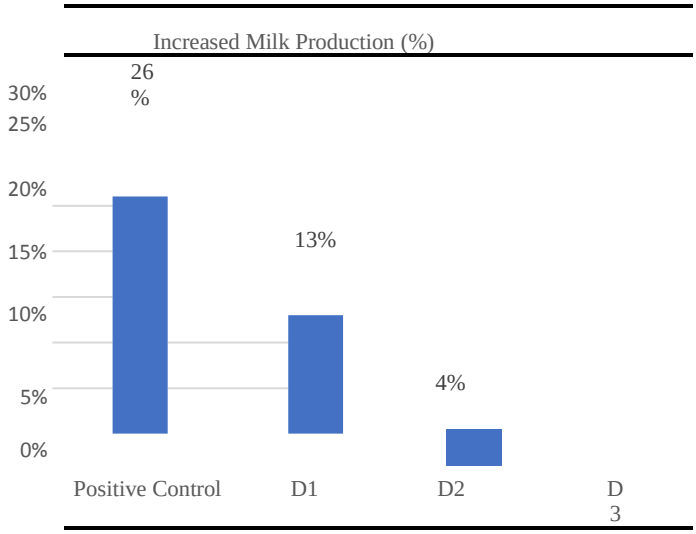

Figure 1: Percentage increase in milk production

Additionally, certain galactagogues work by suppressing dopamine-producing neurons or blocking hypothalamic dopaminergic receptors since dopamine is a physiological inhibitor of the production of the hormone prolactin.[20]

A study by [21] stated that flavonoids, saponins, and steroids can stimulate and increase prolactin levels to affect alveolar epithelial cells so that milk production increases. These compounds also cause the synthesis of steroid hormones. The hormone increases the population and synthesis activity of the mammary gland's secretory cells, which directly affects those cells. The anterior and posterior pituitary glands release prolactin and oxytocin due to the increased steroidal hormone concentration in the bloodstream. These hormones contribute and are directly involved in milk and breast milk production. Oxytocin is a hormone that works with prolactin to promote milk secretion. When myoepithelial cells, which surround the mammary glands' alveoli, contract, the contents of the alveoli are forced out into the milk ducts, leaving the alveoli empty and ready for the next round of milk synthesis. Oxytocin's ability to act on the myoepithelial cells of the breast glands' ducts, which contract and pump milk, can be increased by saponin phytochemical substances.[22]

Javanese ginseng leaves have also been reported to contain vitamins beneficial for nutrition during breastfeeding, such as thiamin, riboflavin, niacin, vitamin C, and tocopherol, apart from secondary metabolites that can improve breast milk.[23] Studies have shown that insufficient nutrition in nursing mothers can reduce the amount of milk production.[24]

Conclusion

Based on the study's results, it can be concluded that the infusion of Javanese ginseng leaves can increase milk production in lactating mice. Java ginseng leaf infusion at a dose of 5000 mg/kg can increase breast milk production significantly but does not have better potential when compared to commercial products.

Conflict of Interest

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

Acknowledgements

The author would like to thank the Hazanah Foundation and LPPM STFI for providing funding for research through the hazanah foundation grant with the head lector accelerated research scheme

Funding

Funding for research through the hazanah foundation grant with the head lector accelerated research scheme no 031/STFI/LPPMPT/X/2022

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