

***Papeja*, herbal potions during breastfeeding in Madura (Indonesia): The use, perceived effectiveness, and documentation of the plants used**

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Abstract. Muslichah S, Azrianingsih R, Indriyani S, Arumingtyas EL. 2022. *Papeja, herbal potions during breastfeeding in Madura (Indonesia): The use, perceived effectiveness, and documentation of the plants used. Biodiversitas 23: 5139-5148.* The World Health Organization recommends breastfeeding as the normal infant feeding method. However, many women often face challenges in breastfeeding their infants. One of the challenges may be a real or perceived insufficient milk supply. Poor breast milk production is the common cause of breastfeeding failure in preterm babies. In Indonesia, Madurese women use *Papeja* (herbal medicines) as a herbal potion to enhance breast milk production. Hence, this study aims to identify the pattern of use, perceived effectiveness, and galactagogues plant component of *Papeja* taken by mothers during breastfeeding in the Sub-districts of Guluk-Guluk and Pasongsongan, Sumenep District. The data were collected through interviews using a semi-structured questionnaire. Sixty women who had agreed to be interviewed, 18 years or older, breastfeeding or breastfeeding in the past 24 months, and two traditional midwifery in the study area were interviewed. We used simple descriptive statistics to summarize the data on demographic, respondent attitudes, and galactagogues plants. Most participants (n = 48) perceived that the herbal galactagogues effectively promoted breastfeeding adequacy. We identified 46 plants from 27 families to have been used in *Papeja*. Some of the plants used by the mothers have been recorded as having benefits for enhancing milk supply, some have not had that information, but most have not yet been chemically tested. Thus, it is important to validate the plants scientifically for possible galactagogues properties, which can be harnessed for future use. Since we recorded those plants as ethnomedicinal and therapeutic plants, phytochemical and pharmacological investigations are recommended because this could lead to developing new medicine to address poor milk production among mothers.

Keywords: Breastfeeding, galactagogue herb, Madurese, *Papeja*

INTRODUCTION

WHO recommends breast milk as the best food for infants during the first six months, exclusively without the addition of any food or drink, and the mother should give it until the age of two years (WHO 2006; Sim et al. 2015; Mathur and Dhingra 2014). Exclusive breastfeeding for infants provides optimal nutrition, a good immune system, long-term health, and other invaluable benefits for the mother and her baby (Bekoe et al. 2018; Geraci et al. 2018). Adequate breastfeeding directly impacts growth, development, and health in the neonatal period (Penagos et al. 2014; Dadalto et al. 2017). The short-term and long-term benefits of breastfeeding are associated with sudden infant death, reduced incidence of otitis media, nonspecific gastroenteritis, severe lower respiratory tract infections, atopic dermatitis, obesity, type 1 and 2 diabetes, and leukemia (Mannion and Mansell 2012). For mothers, breastfeeding will decrease weight faster and cause stronger interactions with the infant. It is good for emotional stability. Breastfeeding also prevents breast cancer and pregnancy, relieves pain, and is economical (Dadalto et al. 2017). However, women face some challenges after childbirth related to the breastfeeding

process, as well as discomfort or breast pain, nipple pain, mastitis, inverted nipples, and infants who have difficulty breastfeeding (Dadalto et al. 2017). Another problem is the inadequate production of breast milk or the non-delivery of breast milk caused by hormonal factors, lack of breast tissue, poor breastfeeding techniques, or psychological factors (Westfall 2003; Padma and Rupalu 2014). Postpartum hypogalactia can also occur due to emotional factors, stress, anxiety, and illness (Liu et al. 2015; McGuire 2018). Social support from the family and self-confidence in breastfeeding have implications for the success of the breastfeeding process (Alzaheb 2017). Some problems, such as increased obesity rates, delayed infant age, and high cesarean section rates, can increase lactation problems that counseling efforts cannot overcome. The mother should do lactagogue to overcome this issue (Bazzano et al. 2016).

Milk production begins around 10 to 22 weeks of pregnancy. Within 48 hours after giving birth, the mother produces a small amount of milk, especially colostrum, up to four days later. Then, after four days of giving birth, milk production increased (McGuire 2018). Lactogenesis is a complex neurophysiological process that involves the interaction between physical and emotional factors with the

activity of the hormone prolactin (Neville et al. 2001). Prolactin is a peptide hormone synthesized by the anterior pituitary gland. This hormone is released in the blood after a stimulus to the nipples of a nursing mother (Javan et al. 2017).

Breastfeeding is an important process for every woman in providing nutrition for her infant immediately after giving birth. Failure to breastfeed harm the infant because the infant will experience nutritional and immune problems. This condition will put the infant at risk of developing chronic diseases. For this reason, pharmacological intervention is needed. The plant has been used as a medicine due to the wide range of phytochemical content of the pharmacological studies. The plant has also been empirically proven to be safer, cheaper, and more widely available than conventional medicines (Elemo et al. 2016). However, scientific evidence on its safety and efficacy is still limited (Mortel and Mehta 2013).

Galactagogue is a substance or drug that can stimulate, maintain and increase breast milk production (Wesfall 2003; Zuppa et al. 2010). Galactagogue or lactagogue is available in conventional and herbal forms. Some galactagogues may react by increasing the production and release of prolactin by directly stimulating the adenohypophysis. In addition, some galactagogues react by blocking dopamine-production neurons or the hypothalamus's dopaminergic receptors (Zuppa et al. 2010). Dopamine D2 receptor antagonists such as metoclopramide (Ehrenkrantz et al. 1986) and domperidone (Wan et al. 2008) are conventional galactagogues widely used in clinical practice. These substances increase the supply and production of breast milk by increasing the prolactin level in the maternal plasma (Wan et al. 2008; Anderson et al. 2007). However, these drugs include chlorpromazine and sulpiride, which cause unpleasant side effects such as xerostomia, indigestion, cardiac arrhythmias, lethargy, sedation, and extrapyramidal symptoms such as tremors, hypertension, hyperhidrosis, even sudden death (Zuppa et al. 2010).

The galactagogue is used in different countries. One of the countries that use galactagogue is Australia (Sim et al. 2013; McBride et al. 2021). The mothers use one or more galactagogues between 2 to 20 weeks. One in six women said they used galactagogues from the first week postpartum. Previous study shows more than 23 respondents said that using domperidone had some side effects (McBride et al. 2021). In comparison, only 3% of women who use herbs experience side effects (McBride et al. 2021). In America, 15% of breastfeeding women use herbs, other prescription blends, OTC, and galactagogue herbs, although they have potential side effects (Mannion and Mansell 2012).

Herbs used to increase breast milk production are also widespread among Tanzanian women. They have a reason for using herbal medicine to increase breast milk production. Mostly, they are cheap, easy to obtain, do not cause side effects, improve maternal and baby health, and have become a family tradition. Although the use of herbs is widespread, the effectiveness, safety, and quality of the ingredients still need further evaluation (Millinga et al.

2022). The use of herbs as galactagogues is also quite high among women in Italy (Aleandri et al. 2014). Most women use herbs because these ingredients are natural and safe. However, the safety and security of these galactagogues still require further study (Zheng et al. 2020; Sim et al. 2013).

Some single and polyherbal plants have been used in many traditional communities in the world to stimulate breast milk production (Abascal and Yarnel 2008). These plants are usually used as part of postnatal care, for example, in Javanese ethnic groups in Solo (Shanthi et al. 2014), ethnic in Banten (Rosadi et al. 2018), Madurese ethnic (Muslichah et al. 2021), Balinese (Monika and Yunita 2021), Kry ethnic in Laos (Lamxay et al. 2011), communities in Malaysia (Jamal et al. 2011) and many others. *Papeja* has been used as a breast milk stimulant by the Madurese tribe in Indonesia for hundreds of years. However, the traditional use of *Papeja* is not well documented, and scientific evidence is limited. This study aims to determine the perceived effectiveness of the *Papeja* potion as galactagogue and to document the plants used in the *Papeja* concoction in Madurese ethnic in Sumenep District, East Java, Indonesia.

MATERIALS AND METHODS

Study area

We did this study in March-June 2018. Data were obtained through semi-structural observation and interviews using questionnaires distributed to 62 women in the Sub-districts of Guluk-Guluk and Pasongsongan, Sumenep District, East Java Province, Indonesia (Fig. 1). Guluk-Guluk is the westernmost sub-district in Sumenep District, 30 km from the city of Sumenep, bordering Pakong Sub-district, Pamekasan District. Geographically, Guluk-Guluk is between 6°00'-7°30' with an altitude of 117 meters above sea level with an area of 59.57 km². Pasongsongan is one of the sub-districts in Sumenep District, which is located on the north side of Madura Island with a population of 53,688 people and an area of 119.03 km² (Wulandari and Maulidi 2017).

Procedures

The respondents were women 18 years or older who were breastfeeding or had breastfed 24 months before and used *Papeja* ingredients during breastfeeding. Interviews were conducted face-to-face using the local language. The respondents were selected based on information from traditional birth attendants and herbalists in the study area. Sixty women met the criteria determined by the researchers and two birth attendants who knew the ingredients of *Papeja*.

Before we conducted the interview, each respondent was explained the purpose of this study and asked if they were willing to participate. We obtained permission from the local government area and respondents. Participation was voluntary, and respondents were informed of their right to withdraw at any time from the study if they desired without any penalty.

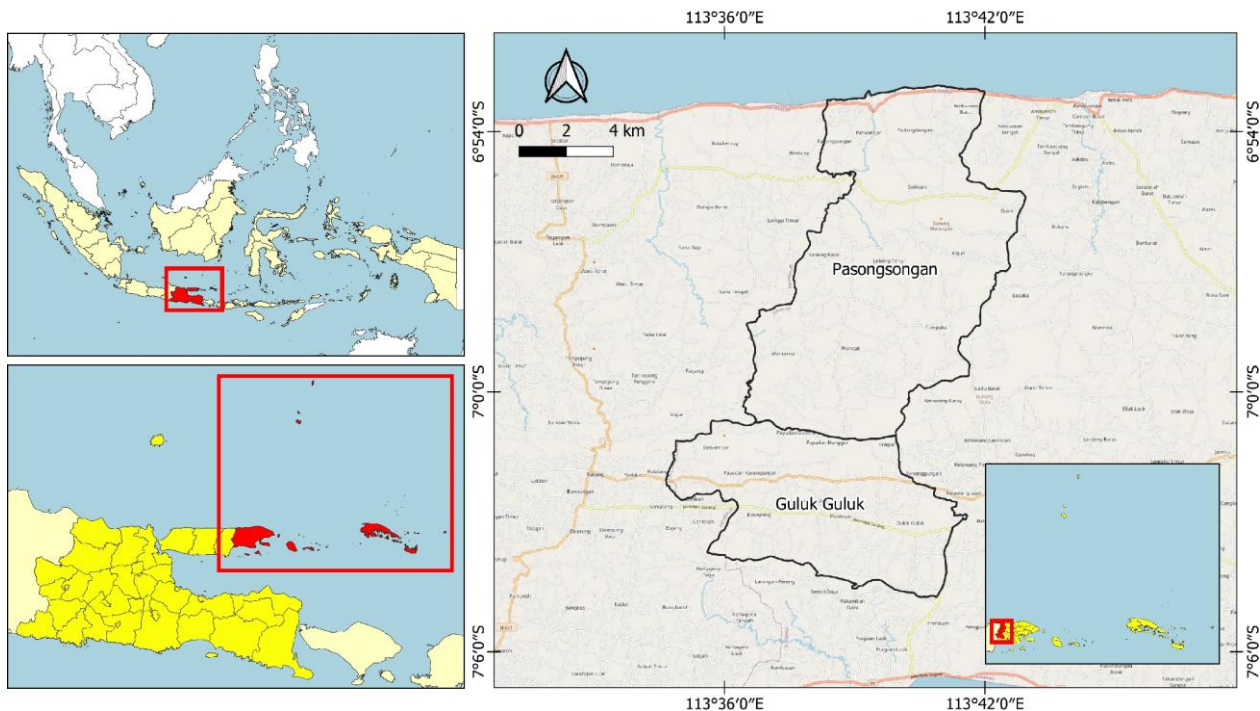


Figure 1. Map of the study area and geographical location of surveyed Sub-districts in Sumenep District, Indonesia

We used some questions during the interview to gather information about the reasons for using *Papeja*, patterns of use and composition of the galactagogue herb, dosage forms, and sources of recommendations. Furthermore, they were also asked about the perception of the effectiveness, side effects, and safety of herbs based on each participant's personal experience.

Data recording included respondent demographic data, the name of the plant used in the herb, the reasons for use, the source of recommendations, how to manufacture it, and how to use it. In addition, perceptions about safety and efficacy felt when using *Papeja* ingredients were also asked in the interviews.

Data analysis

Data analysis used descriptive statistical methods such as percentages. This method of data analysis was used to summarize some descriptive data obtained from the interviews about demographic profiles, usage patterns, perceptions, and user knowledge of *Papeja* potion. We used the Microsoft Excel 2010 spreadsheet to organize the data.

RESULTS AND DISCUSSION

Results

Informant characteristics

All respondents resided in rural areas in Sumenep District. Of the 60 respondents who used *Papeja*, characteristic data were obtained, including age, education, number of children, and occupation (Table 1). As shown in the table, *Papeja* users have different levels of education

and employment. This result is in line with the findings reported by Satriyati (2016) that the tradition of drinking herbal medicine in Madura is still kept. The majority of participants had 2 children (28.33%) and 1 child (26.67%), most of whom had secondary school (35.00%), some had no formal education (8.33%), and 51.67% were housewives.

Pattern of use

All respondents were women who used *Papeja* with various plant compositions, namely between 2-17 medicinal plants. *Papeja*, like the Madura herb, generally uses more than one plant (Muslichah et al. 2021). Among the 60 respondents, 43 (71.70%) used *Papeja* in the form of fresh juice extract, 10 (16.67%) in powder form, and 7 (11.67%) in the form of boiled decoction. More than half (63.30%) received *Papeja* from herbal makers, 9 (15.00%) people got it from traditional healers, and the rest (21.70%) got it from their grandmothers or mothers.

There were 46 medicinal plants used in *Papeja* herbs from 27 families (Table 3). The ten most popular plants used as galactagogue are *katuk* leaves (100%), papaya leaves (86.67%), *beluntas* (76.67%), fenugreek (71.67%), fennel (58.33%), ginger (38.33%), *temulawak* (31.67%), anise (26.67%), garlic (25.00%), and black cumin (15.00%) (Figure 2).

Perceptions of the safety and efficacy of *Papeja* potion

Most respondents felt they had to drink *Papeja* ingredients to get enough breast milk (80.00%). They believe this herb can increase breast milk production. Some other respondents (48.33%) felt that *Papeja* has uses that not only increase breast milk. As many as 96.67% of respondents said *Papeja* is safer than chemical drugs. Most

of them were satisfied with the effects and results they felt after using *Papeja*. Respondents also did not believe (91.67%) that *Papeja* caused side effects (Table 4).

Knowledge of *Papeja* potion

The respondents had different opinions about when to start drinking the herb. Some participants drink *Papeja* from the beginning of childbirth (12.38%). The respondents did this because they did not give birth with the help of medical personnel but with traditional birth attendants. Most respondents take herbal medicine after the midwife's medicine is consumed, usually after seven days. Other respondents, even though they took medicines from midwives, still took herbal medicines (21.43%). But they drink for about two hours, according to the midwife's instructions.

Most respondents received herbal medicine to boost breastfeeding from traditional birth attendants (52.86%). Some respondents obtained herbal medicine from herbal medicine sellers, both home-based herbal medicine sellers and herbal medicine shops. Meanwhile, 9.52% said it was made by family members such as mothers or grandmothers. Regarding the knowledge of *Papeja* composition, most users said that they do not know (56.67%), but they know its efficacy. Some respondents (27.62%) said they knew part of the composition of the herb. Only 16.67% of respondents knew the full composition of *Papeja*, because they had observed their mother or grandmother making their own, or they asked the traditional birth attendant who cared for and massaged them. The encouraging thing is that most respondents (94.29%) would suggest other women take this herbal remedy because they have felt its benefits for their bodies and the health of their infants (Table 5).

Table 1. Respondents' demographic profile

	Variable	Number of person	Percentage (%)
Age	18-28	29	48.33
	29-39	26	43.33
	> 39	5	8.33
Education	Uneducated	5	8.33
	Primary school	10	16.67
	Secondary school	21	35.00
	High school	16	26.67
	Diploma or Bachelor	8	13.33
Number of children	1	16	26.67
	2	17	28.33
	3	14	23.33
	4	7	11.67
	> 5	6	10.00
Occupation	Housewives	31	51.67
	Teacher	10	16.67
	Farmer	9	15.00
	Self employ	10	16.67

Table 2. Pattern of use

Usage patterns	Percentage (%)
Dosage form of <i>Papeja</i>	
Juice	71.70%
Powder	16.67%
Boiled potion	11.67%
Prescription source of <i>Papeja</i>	
Herbal makers/sellers	63.30%
Family	21.70%
Traditional healers	15.00%

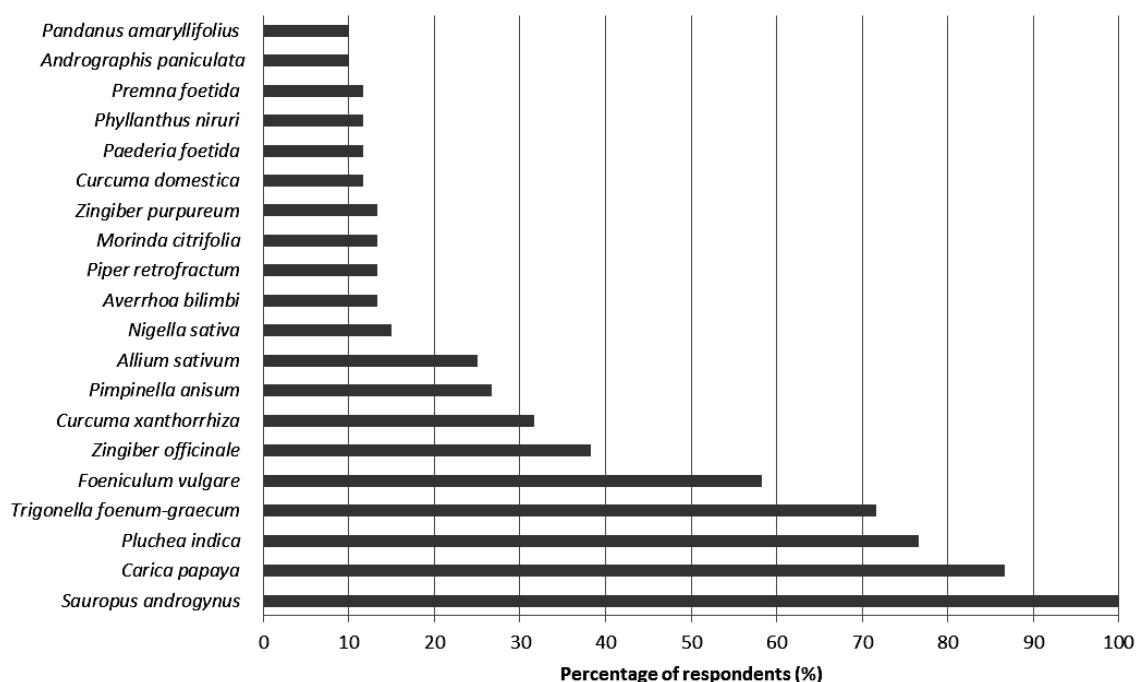


Figure 2. Frequency of mention of galactagogue taxa

Table 3. Medicinal plants used for galactagogues

Botanical name	Family	Local name	Part used	Life form
<i>Andrographis paniculata</i> (Burm.f.) Nees	Acanthaceae	Samiroto	Whole plant	Shrub
<i>Acorus calamus</i> L.	Acoraceae	Jerengo	Rhizome	Herb
<i>Allium sativum</i> L.	Amaryllidaceae	Babang Pote	Bulb	Herb
<i>Coriandrum sativum</i> L.	Apiaceae	Katomber	Seed	Herb
<i>Foeniculum vulgare</i> Mill.	Apiaceae	Adas	Fruit	Shrub
<i>Pimpinella anisum</i> L.	Apiaceae	Jungantep	Seed, leaves	Herb
<i>Alyxia reinwardtii</i> Blume	Apocynaceae	Palasare	Bark	Tree
<i>Elephantopus scaber</i> L.	Asteraceae	Talpak Tanah	Leaves	Herb
<i>Pluchea indica</i> (L.) Less.	Asteraceae	Bluntas	Leaves	Shrub
<i>Carica papaya</i> L.	Caricaceae	Kates	Leaves, fruit	Tree
<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Cor Etek	Leaves	Herb
<i>Elaeocarpus grandiflorus</i> Sm.	Elaeocarpaceae	Anyang	Fruit	Tree
<i>Caesalpinia sappan</i> L.	Fabaceae	Secang	Stem	Tree
<i>Parkia roxburghii</i> G.Don	Fabaceae	Kadebung	Seed	Tree
<i>Sindora sumatrana</i> Miq.	Fabaceae	Samarantok	Fruit	Tree
<i>Tamarindus indica</i> L.	Fabaceae	Accem	Fruit, leaves	Tree
<i>Trigonella foenum-graecum</i> L.	Fabaceae	Klabet	Seed	Shrub
<i>Ocimum basilicum</i> L.	Lamiaceae	Komangi	Leaves	Shrub
<i>Premna foetida</i> Reinw. ex Blume	Lamiaceae	Jebbeuh	Leaves	Tree
<i>Cinnamomum sintoc</i> Blume	Lauraceae	Sintok	Bark	Tree
<i>Masosia aromatica</i> Becc.	Lauraceae	Masoji	Bark	Tree
<i>Lawsonia inermis</i> L.	Lythraceae	Pacar	Leaves	Tree
<i>Helicteres isora</i> L.	Malvaceae	Kaju Oleh	Fruit	Shrub
<i>Urena lobata</i> L.	Malvaceae	Ka'reka'	Leaves	Shrub
<i>Streblus asper</i> Lour.	Moraceae	Pelleh	Leaves	Tree
<i>Melaleuca leucadendra</i> (L.) L.	Myrtaceae	Gelam	Seed	Tree
<i>Averrhoa bilimbi</i> L.	Oxalidaceae	Blimbing Buluh	Leaves	Tree
<i>Pandanus amaryllifolius</i> Roxb. ex Lindl.	Pandanaceae	Pandan	Root	Shrub
<i>Phyllanthus niruri</i> L.	Phyllanthaceae	Nir Meniran	Whole plant	Herb
<i>Sauropus androgynus</i> (L.) Merr.	Phyllanthaceae	Ger Ager	Leaves	Shrub
<i>Piper betle</i> L.	Piperaceae	Sereh	Leaves	Vine
<i>Piper retrofractum</i> Vahl	Piperaceae	Cabe Jhamo	Fruit	Vine
<i>Gigantochloa apus</i> (Schult.f.) Kurz	Poaceae	Pring Tale	Leaves	Tree
<i>Nigella sativa</i> L.	Ranunculaceae	Jinten Ereng	Seed	Shrub
<i>Morinda citrifolia</i> L.	Rubiaceae	Kodduk	Fruit	pohon
<i>Paederia foetida</i> L.	Rubiaceae	Kasembukan	Leaves	Vine
<i>Murraya paniculata</i> (L.) Jack	Rutaceae	Kamoning	Leaves	pohon
<i>Datura metel</i> L.	Solanaceae	Cobhung	Leaves	pohon
<i>Usnea barbata</i> Fries	Usneaceae	Kaju Angin	All	Aerial part
<i>Boesenbergia pandurata</i> (Roxb.) Schltr.	Zingiberaceae	Konkeh	Rhizome	Herb
<i>Curcuma aeruginosa</i> Roxb.	Zingiberaceae	Temo Ereng	Rhizome	Herb
<i>Curcuma domestica</i> Valetton	Zingiberaceae	Konyek	Rhizome	Herb
<i>Curcuma xanthorrhiza</i> Roxb.	Zingiberaceae	Temolabak	Rhizome	Herb
<i>Kaempferia galanga</i> L.	Zingiberaceae	Kencor	Rhizome	Herb
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Jhai	Rhizome	Herb
<i>Zingiber purpureum</i> Roscoe	Zingiberaceae	Pandiang	Rhizome	Herb

Discussion

This study describes the results of interviews about the use, perceived effectiveness, safety, and knowledge in terms of *Papeja* potion information. The 60 respondents were women who had children. The selected respondents in this category are expected to provide information about using *Papeja* to increase breast milk production. First, they experience and use *Papeja* as a galactagogue, and then they can convey the benefits and side effects felt. Most respondents were 18–28 (48.33%), the productive age for having children. Some others are high school education (35.0%). There were 13.3% of respondents from higher education (diploma, bachelor). Most of the respondents

were housewives (51.67%). Differences in age, education, and occupation will affect the perception of herbal use. It is generally believed that less educated women are more likely to use herbal medicine. However, in this study, only 8.33% of women were uneducated, and 16.67% were primary school graduates. The selection of respondents in this study was not random but based on information from rural midwifery in the study area. Sim et al. (2014) did a study with a smaller number of respondents in Australia, with 20 lactating women using galactagogues interviewed about their experiences using herbs to improve breast milk, both regarding the efficacy and safety of galactagogues consumed.

Table 4. Perceptions of safety and efficacy of *Papeja* potion

Reason for using <i>Papeja</i> herb	Percentage (%)
Must drink <i>Papeja</i> herb	
Agree	80.00
Doubt	11.67
Disagree	8.33
<i>Papeja</i> can increase breast milk	
Agree	86.67
Maybe	13.33
<i>Papeja</i> effect is more than just increasing breast milk	48.33
<i>Papeja</i> is safer than chemical drugs	
Agree	96.67
Doubt	3.33
Satisfaction with the effects felt after drinking herbal medicine	86.67
Agree	13.33
Doubt	
<i>Papeja</i> causes certain side effects	
Disagree	91.67
Maybe	8.33

Table 5. User knowledge of *Papeja* herb information

Questions about herb information	Percentage (%)
Time to start drinking herbal medicine:	
Since the first day of giving birth	12.38
After the medicine from the midwife runs out	66.67
On the first day of delivery but also take medicine from the midwife (there is a time lag)	21.43
The ingredients are obtained from:	
From traditional birth attendants	52.86
Buying at home herbal medicine sellers/herbal medicine shops	38.57
Ordinary families make their own	9.52
Knowledge of <i>Papeja</i> herb composition:	
Knowing	16.67
Knowing partially	27.62
Not knowing	56.67
Will continue to use herbal medicine or suggest to other women:	
Yes	94.29
Undecided	5.71

All respondents used *Papeja* potion as a polyherbal with a composition that differed between 2 to 17 plants. There are several dosage forms and ways to make *Papeja* decoction. The mixture of some medicinal plants is intended to maximize its effect as a galactagogue and minimize side effects. The mixture is made by squeezing or mixing and then adding water, squeezing, heating, and then it is ready to drink. Some buy it in herbal medicine stores in the form of *simplicia* to be boiled, filtered, and consumed with the addition of honey, eggs, and lime juice. Some others buy or make it in powder form, taken at a dosage of 1 tablespoon. This decoction is taken daily for 10-20 days after calving. The powder form has the advantage of being more durable in storage. One of the compositions of *Papeja* is papaya leaves, *katuk* leaves, *beluntas*, fenugreek, ginger, *kencur*, *temulawak*, and several other leaves. These herbs contain chemicals such as saponins, tannins, alkaloids, flavonoids, and anetol, which have an important role in providing lactogenic effects (Khairani et al. 2021). This combination will strengthen the pharmacological effect of the herb as a lactagogue due to the synergistic properties of these various plants. A study on the combination of herbs using fenugreek, ginger, and turmeric has been done by Bumrungpert et al. (2018), and it showed increased milk production, and no side effects have been found. Some studies have also shown that galactagogue herbs can increase breast milk production (Forinash et al. 2012; Zapantis et al. 2012; Mortel and Mehta 2013). In another study, polyherbal galactagogue tea may increase breast milk production without causing side effects (Ozalkaya et al. 2018).

In this study area, most mothers chose herbs in the form of fresh juices for consumption (71.70%). Juice ingredients include papaya leaves, *katuk*, *beluntas*, and rhizomes such as *temulawak*, ginger, *bangle*, turmeric, and aromatic ginger. All ingredients are mixed, squeezed, and filtered. Juice is consumed 150 mL two times a day. Madurese

women drink *Papeja* for the first 10 days after giving birth. Using herbal medicine in fresh juice is also found in the herb *Uyup-uyup*, lactagogue, which comes from the Javanese tribe (Hayati et al. 2019). The dosage measurement of herbal ingredients is very simple. For example, a handful for leaves, finger size for rhizomes, one spoon for seeds, or several whole plants. For fresh juice preparations, these ingredients are instantly mashed or blended. But for powder preparations, the ingredients need to be dried first. After drying, the ingredients are mashed with a grinding machine. A total of 16.67% of respondents chose the powder dosage form. The use of herbs in powder form is carried out using a tablespoon of herbal medicinal powder brewed with warm water and then stirred until well mixed. Honey, lime juice, palm sugar, or salt are usually added to reduce the bitter taste.

Most sources of herbal recipes come from herbalists or sellers, the traditional birth attendant (63.30%), family (21.70%), and others (15.0%) from traditional healers. Different from this study in Saudi Arabia on women after giving birth, the source of most herbal recipes is family or friends, while herbalists are number two (Alsubaie et al. 2017; Al-Ghamdi et al. 2017). This finding is understandable because the traditional birth attendant usually assists Madurese women after giving birth by bathing the infant or massaging the mother, usually for 40 days. The traditional midwives, who usually have expertise in making these herbs, are asked to provide *Papeja* for nursing mothers. This recipe is also obtained from the family because the habits of the Madurese family in the past, especially women, can make herbs used by the family to maintain health and postnatal care, including *Papeja*.

The family and the traditional midwife's role in preserving the use of *Papeja* is very significant. The majority of users claim to get recommendations for the use of *Papeja* from families or traditional midwives. This study shows that users of *Papeja* as a galactagogue prefer to get

advice from more experienced people. They rather believe their mothers, the traditional birth attendant or *dukun*, to care for them and their infant than others, such as health workers. In addition, a study in the Philippines also claimed that family, friends, and traditional healers influence the use of traditional medicine, besides the information from the internet or magazines (Foong et al. 2020). Although doctors are usually a source of information about treatment, in some areas where herbs are used, not many mothers tell doctors what they are taking to improve their breastfeeding. Most women who consume herbs do not tell health workers because they think that it is not necessary or prohibited. Therefore, training on herbal medicine needs to be provided for all health practitioners as part of professional training to improve their knowledge. Thus, they can give better advice to mothers regarding herbal medicines. This phenomenon also occurs in some countries, such as Australia (Sim et al. 2013; McBride et al. 2021) and Sierra Leone (James et al. 2019). Women in developed countries, such as Australia, have publicly claimed that they prefer complete information about the use of herbs during breastfeeding (Sim et al. 2013). However, the traditional communities, such as those in Madura, are quite sure that the herbs they use are safe without side effects because their ancestors have been using these herbs for many years.

Efficacy based on perception can be explained by the theoretical framework of the health belief model revised by Champion (Abraham and Sheeran 2015), that *Papeja* potions are efficacious because women feel the benefits of drinking this *Papeja* potion. By drinking *Papeja* potion, we can prevent the problem of lack of milk production. In other words, we can overcome their health problems related to lactation by drinking *Papeja* potion. This belief made 80% of respondents feel they should drink *Papeja* after giving birth, and 86.67% agreed that *Papeja* could increase milk production. Others who doubt the efficacy of *Papeja* may be because they are unsure whether the adequacy of breast milk they experience is due to *Papeja* or other things. Most respondents also believe that *Papeja* is safer than chemical drugs (96.67%). Some respondents said that the efficacy of *Papeja* is more than just increasing breast milk production (48.33%). This finding is understandable because *Papeja* potion contains more than one plant with other pharmacological activities such as anti-inflammatory, analgesics, wound healing, and others. A total of 91.67% did not agree that *Papeja* has side effects. According to them, *Papeja* has been proven to be used in study areas to increase milk production for many years, and they do not feel any annoying effects. They say herbs are natural, and natural is safe. Sim et al. (2014) and Eid and Jaradat (2020) also claimed women's perceptions of the efficacy and safety of such herbs. The latter chose galactagogue herbs because they believed herbs were safer than chemical drugs. However, the claim that there are no side effects is simply empirical evidence felt by some women, as there has been no study on side effects, toxic effects, or pharmacological effects of *Papeja*. Health workers should provide information about side effects that

may arise for mothers and their infants, so mothers can be more careful in using herbs.

The components of the materials used by women in this ethnic group come from local wisdom. Knowledge of the composition of *Papeja* potion is passed down from a mother to her daughter from one generation to the next. Previous generations have made the composition of the herbs. His descendants continue to use it without changing anything. Some do not even know why the mixture of ingredients differs between families in other villages, even though the name is the same *Papeja*. It can be said that sometimes there is a difference between traditional use and scientific data. These people use empirical evidence that they experienced or information from family or friends who had used the herb while breastfeeding. Some plants in the composition of the herb have been studied and tested on animals or even in clinical trials on humans, but some of their efficacy is not yet known. The women also said that the *Papeja* potion does not cause side effects because it comes from natural ingredients that are more acceptable to the body. However, people sensitive to an ingredient may experience certain side effects because of everyone's different metabolic conditions. Efficacy and side effects are based on perceptions arising from each person's personal experience.

Regarding when it is time to start taking *Papeja*, most respondents (66.67%) answered after the midwife's medication was consumed, about seven days after giving birth. On the other hand, 21.43% of respondents answered from the first day of delivery but also took medicine from the midwife with a time lag of approximately two hours. Information regarding the prohibition of taking medicines and herbs at the same time is obtained from health workers. So some respondents decided to use herbal medicine after finishing taking a midwife's medicine or using herbal medicine from the first day after giving birth, but there was a time lag. However, most respondents are very satisfied with the results and will advise other women to take it regularly. The reason is that they feel fitter by taking herbal remedies and their infants are also healthier because they get enough breast milk.

Although in interviews, almost all mothers (94.29%) claimed that they would continue to use herbs or recommend them to other women, most of them (56.67%) said that they did not know the composition of *Papeja*, or only some of the ingredients they knew about (27.62%). This finding is understandable because the herbal ingredients they use are mostly obtained from traditional birth attendants (52.86%) or herbalists or herbal medicine shops (38.57%) in the form of ready-to-drink or ready-to-brew herbs. The older generation still dominates traditional knowledge about herbs. It is happening not only in Madura but also in other ethnic groups and countries. A study in the Sicily region of Italy also proves this statement (Geraci et al. 2018). That herb is a part of cultural identity that must be preserved, especially by the younger generation, before the tradition disappears permanently.

Nursing mothers use various herbal plants in many countries. The most widely used plants in Tanzania are black pepper (*Piper nigrum*) and field pumpkin (*Cucurbita*

pepo) (Milinga et al. 2022). Then, in Australia, the most commonly used plants are fenugreek (*Trigonella foenum-graecum*) and ginger (*Zingiber officinale*) (McBride et al. 2021). In Taiwan, female ginseng (*Angelica sinensis*), rice-paper plant (*Tetrapanax papyrifer*), and some polyherbal herbs are used (Chao et al. 2020). The most widely used plants in Palestine are fenugreek (*Trigonella foenum-graecum*), cinnamon (*Cinnamomum verum*), anise (*Pimpinella anisum*), and peppermint (*Mentha x piperita*) (Eid and Jaradat 2020). Meanwhile, Madurese used polyherbal, especially papaya leaves (*Carica papaya*), noni (*Morinda citrifolia*), beluntas (*Pluchea indica*), *katu* leaves (*Sauropus androgynus*), fenugreek, fennel (*Foeniculum vulgare*), and some rhizomes, such as ginger and turmeric to increase milk production. These plants are often used either singly or in combination. This difference may occur because the traditional and cultural background of each woman who uses these herbs is different.

Some plants in *Papeja* potion have been studied with the effects of galactagogue. *Katu* leaf decoction and extract have been proven to increase milk production in breastfeeding mothers (Yolanda et al. 2022). *Katu* leaves are traditionally used to treat fever, act as an anti-inflammatory, and increase milk production. The main chemical constituents of *katu* leaf are flavonoids and polyphenols, which have antioxidant, anti-inflammatory, and anti-obesity substances (Zhang et al. 2020). *Katu* leaf also affects prolactin expression and milk production (Soka et al. 2010). Likewise, single and combination papaya leaves in the *uyup-uyup* concoction can also increase milk production (Kusumaningrum 2017).

There is plenty of evidence that fenugreek containing trigonelline, diosgenin, luteolin, phenolic acids, and protodioscin has efficacy as galactagogue (Khan et al. 2018). Fenugreek seeds (*Trigonella foenum-graecum*) contain mucilage, trigonelline, 4 hydroxy isoleucine, sotolon, diosgenin, luteolin, phenolic acids, and protodioscin (Dietz et al. 2016). Fenugreek has been used worldwide to increase breast milk production in individual or combination ingredients. The galactagogue effect of this plant is likely to be more psychological (Zapantis et al. 2012). The study that has been done on fenugreek has shown a mild galactagogue effect with an unknown safety profile (Khan et al. 2018). Some evidence suggests that fenugreek results in a more effective therapeutic impact in the first few days after giving birth than in the two weeks postpartum (Abdou and Fathey 2018). Some studies use a combination of polyherbal ingredients.

Meanwhile, fenugreek becomes one of the ingredients that will have different effects from studies using fenugreek alone without any ingredients. The side effects are gastrointestinal disturbances such as nausea, vomiting, diarrhea, and flatulence. In addition, liver toxicity has also been reported alone or in combination with fenugreek-containing herbs (Sahin et al. 2016; Partuila and Dougherty 2017).

Other plants with the effects of galactagogue are fennel (Geraci et al. 2018), anise (Hosseinzadeh et al. 2014), black cumin (Hosseinzadeh et al. 2013), tamarind with essential oil content, flavonoids, and tannins (Putri et al. 2018) and

have antimicrobial, antioxidant, anti-venom properties, it is also used as a galactagogue (Sahu 2015), ginger (Paritakul et al. 2016), and *temulawak* (Desbriyani et al. 2017). Fennel fruit contains phytoestrogens, anethole, and estragole, increasing breast milk production. It is also a spice in some traditional dishes (Geraci et al. 2018). The main content of anise (*Pimpinella anisum*) is trans-anethole and estragole, with a solid estrogenic that supports its use as a galactagogue. A study on anise seed water and ethanol extracts showed that they could increase milk production in rats (Hosseinzadeh et al. 2014). The aqueous and ethanolic extracts of black cumin seeds could increase milk production in rats (Hosseinzadeh et al. 2013).

The limitation of this study is that we did it in a limited area with a limited number of respondents, so the conclusions obtained may not be representative of a larger population, and we studied it in rural areas. Perhaps it would have different results if it was conducted in urban areas. Therefore, it is necessary to explore using *Papeja* with a larger maternal sample size. But generally, the culture of drinking herbal medicine is still maintained among Madurese women, especially in rural areas.

In conclusion, for most Madurese women, passed down through the generations, *Papeja* has become a solution to overcome the problem of breast milk production and is believed to contribute not only to breastfeeding but also to women's health problems after childbirth. For a small number of respondents who expressed doubts about the benefits of *Papeja*, it may be because scientific evidence about the effectiveness of *Papeja* has not existed, even though empirically, this herb has been used for many years. So more study is needed to ascertain the pharmacological and toxicological effects of *Papeja* to obtain scientific evidence of the use of this herb as a galactagogue. Safety data such as toxicity testing and monitoring data on possible side effects for mothers and infants are not available. This finding is the next task for researchers to prove the safety and comfort of herbal use for mothers with insufficient breast milk.

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