WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

"*Carica Papaya* and Maternal Health: A Comprehensive Review of Safety, Efficacy, and Clinical Applications in Pregnancy, Lactation, and Reproductive Health"

S.NIVETHA [1], K.MALARVIZHI [2], DR. J.KARTHI, phD (3), G.HEMALATHA [4].

[1]-UG student, Pallavan Pharmacy College, Iyyangarkulam.
[2]-Asst. Prof. Department of Pharmaceutics, Pallavan Pharmacy College, Iyyangarkulam.
[3]- Principal(HOD), Department of Pharmacognosy, Pallavan Pharmacy College, Iyyangarkulam.
[4]- PG Student, Department of Pharmacology, Pallavan Pharmacy College, Iyyangarkulam.

ABSTRACT:

This review examines the effects of *Carica papaya* on pregnancy, ovulation, hemoglobin levels, and breastfeeding. Significant morphological changes in embryonic development are known to result from papaya's teratogenic and abortifacient qualities, especially when it is unripe. According to the study, unripe papaya may have contraceptive properties as it might interfere with the estrous cycle and perhaps reduce fertility. The study also shows that pregnant women with anemia can significantly increase their hemoglobin and hematocrit levels by regularly consuming 110 grams of papaya per day, in addition to iron supplementation. Additionally, it has been demonstrated that papaya leaf juice raises prolactin hormone levels, improving the quality of breast milk and promoting the development of nursing mothers' infants. The results show that ripe papaya and its leaf juice can be advantageous dietary components for enhancing maternal health and lactation, while unripe papaya poses risks during pregnancy.

KEYWORDS: Unripe *Carica papaya*, pregnancy, ovulation, lactation, haemoglobin, anaemia, papaya leaf juice.

INTRODUCTION:

The papaya (*Carica papaya*) is the fruit that is most commonly categorized as hazardous during pregnancy in India. Because of the teratogenic and abortifacient properties of papaya, women are strictly prohibited from consuming either ripe or unripe papaya. Eighty-two percent of pregnant women in a survey of 1,200 women from all regions of Tamil Nadu, India, avoided papaya (1). Because papaya plants have specific cells called laticifers, they are laticiferous. Laticifers are found in most plant tissues and exude latex. The four cysteine endopeptidases—papain, chymopapain, glycyl endopeptidase, and caricain—are abundant in papaya latex, which is widely recognized for having varying amounts in fruit, leaves, and roots. Papaya latex is commercially extracted from fully ripe and unripe fruit. Compared to green papaya, ripe papayas have less latex, possibly because the cells that produce latex break down or cease functioning as they age (10). An essential phase of the female reproductive cycle is gestation. Trimester one (age 0–12 weeks), the second (age 13–28 weeks), and the third (age 29–40 weeks gestational age) are the three phases (trimesters) of pregnancy (8). Adequate care should be provided throughout each trimester to ensure a safe birth of the offspring into the world. Oxytocin causes the uterine smooth muscles to contract during parturition (labor) to make it easier for the fetus to be expelled from the uterus. The biological activity of *C. papaya*'s fruits, shoots, leaves, rinds, seeds, roots, and latex, among other components. Papain, chymopapain, cystatin, à-tocopherol, ascorbic acid, flavonoids, cyanogenic glucosides, and glucosinolates are among the several active ingredients found in *C. papaya* leaves that have been demonstrated to raise blood antioxidant levels and lower lipid peroxidation. Papaya fruit and seed extracts have been shown to have bactericidal properties. Folk medicine claims that *C. papaya* latex may help treat external burns and scalds, as well as cure dyspepsia. Papaya fruits and seeds are powerful antihelminthic and antiamoebic agents (7). Saponins, alkaloids, tannins, flavonoids, cardiac glycosides, anthraquinones, phlobatinins, anthocyanosides, and phenols were all detected by pyrochemical study of the *C. papaya*. Each plant portion has a different concentration and makeup of these different phytochemicals (6). Green papaya is utilized as an emmenagogue, a contraceptive, and an abortifacient in traditional Indian medicine (37)., which makes iron more soluble in the small intestine and enhances its absorption via the duodenum's Given the global increase in unwanted pregnancies, contraceptives are promoted as a useful tool for addressing issues ranging from HIV/AIDS to unwanted pregnancies (15). Birth control, or contraception, is the term used to describe techniques of preventing conception. The decrease in pregnancies that are highly risky for the life of the mother, fetus, and newborn is the biggest health advantage that female contraceptive usage has demonstrated. Consequently, women employ conventional forms of contraception, such as vaginal rings, tablets, patches, and implants, which can lead to negative health outcomes such as amenorrhea, irregular and heavy bleeding, vaginal discomfort, and diminished libido (15). Iron-rich diets are another strategy to lower the prevalence of anemia in expectant mothers. It is believed that vitamin C can double the absorption of nonheme iron (50). The body absorbs nonheme iron less easily. Ascorbic acid, another name for vitamin C, is a water-soluble vitamin that is believed to improve nonheme iron absorption. By acting as a reducing agent, vitamin C helps the GI tract absorb iron. Iron and vitamin C interact to generate an iron chelate complex in the mucous membranes. Iron absorption is facilitated by vitamin C, which in the colon converts ferric iron (Fe 3+) to ferrous iron

(Fe 2+) for easier absorption. The more acidic the stomach's pH, the bigger the decrease process will be. Increased stomach acid due to vitamin C might result in a 50% increase in iron absorption. 8 Because of this, vitamin C has to be taken concurrently with iron to be effective. According to current guidelines, pregnant women should take 85 mg of vitamin C daily. Vitamin C is said to be abundant in foods like papaya. It requires at least 480 kcal of calories per day to maintain exclusive breastfeeding, which puts a metabolic strain on the mother's body. Therefore, for moms to fulfill their job in nursing, some extra nourishment is required to improve the production of breast milk. Consuming galactogogues, such as papaya, which contain quercetin, which can stimulate the prolactin hormone, also aids in the nursing process (28). It is especially thought that raw or unripe papayas raise oxytocin levels, which in turn promote the production of breast milk.

MORPHOLOGICAL CHARACTERS:

Synonym: pawpaw
Biological source: *Carica papaya* L.
Family: Caricaceae
Color: green(unripe), yellow or orange (ripe)
Shape: oval or pear-shaped, also round or oblong

UNRIPE PAPAYA

Figno:1 (image source: Google)

RIPE PAPAYA

Figno:2(image source:google)

CHEMICAL CONSTITUENTS OF PAPAYA:

NO.	Categories	Phytoconstituents	Plant Part(s)
1	Enzymes	Papain, chymopapain A and B, endopeptidase papain III and IV glutamine cyclotransferase, peptidase A and B and lysozymes.	Unripe fruit (Latex)
2	Carotenoids	β carotene, crytoxanthin, violaxanthin, zeaxanthin.	Fruits
3	Alkaloid & Enzyme	Carposide, and an enzyme myrosin.	Roots
4	Glucosinolates	Benzyl isothiocynate, benzylthiourea, β-sitosterol, papaya oil, caricin and an enzyme myrosin.	Seeds
5	Minerals	Calcium, potassium, magnesium, iron, copper, zinc.	Shoots and Leaves
6	Monoterpenoids	4-terpineol, linalool, linalool oxide.	Fruits
7	Flavoniods	Quercetin, myricetin, kaempferol.	Shoots
8	Alkaloids	Carpinine, carpaine, pseudocarpine, vitamin C and E, choline, carposide.	Leasves and Heartwood
9	Vitamins	Thiamine, riboflavin, niacin, ascorbic acid, α-tocopherol.	Shoots and Leaves
10	Carbohydrates	Glucose, sucrose, and fructose.	Fruits

Fig no:3(image source: google)

MATERIALS AND METHODS:

Role of unripe Carica papaya in pregnancy:

Abortion will result from different dosages of an aqueous methanolic extract of unripe *Carica papaya.* The unripe papaya fruit, leaves, and stem contain a milky white substance called papaya sap, sometimes referred to as latex. Numerous physiologically active substances found in *C. papaya* latex are what give the fruit its known teratogenic and abortifacient qualities. Fruit, latex, leaves, and roots all have different concentrations of these substances (37). Papain and chymopapain are found in the unripe papaya, which has a high latex content. The papaya's latex is what causes the strong uterine contraction that leads to early labor or miscarriage. An enzyme called papain affects prostaglandin and other chemicals used during birthing. Prostaglandin and oxytocin are stimulated by latex, causing uterine contractions and early labor. The sex and age of the tree also affect how much fresh papaya latex and dry papaya latex (crude papain) are produced. Compared to male trees, cruder papain is produced by female and hermaphrodite trees. According to Schmidt (1995), the papain found in *C. papaya* showed signs of embryotoxicity, increased post-implantation loss, and anti-implantation activity (37).

Role of Carica papaya on ovulation:

The process of ovulation is similar to inflammation. Anti-inflammatory medications have been used. To prevent ovulation. They work by preventing the cyclo-oxygenase enzyme from functioning. The study's findings showed that while the alcoholic root extract of the male *C. papaya* may have anti-inflammatory qualities because of its alkaloid content, it did not inhibit the cyclo-oxygenase enzyme, particularly COX-2, which is necessary for follicular rupture through the activation of proteases, neovascularization, leukocyte migration, and smooth muscle contraction. This is in contrast to indomethacin, a well-known anti-inflammatory medication used to prevent ovulation (6).

Role of Carica papaya on haemoglobin level during pregnancy:

Hemoglobin and hematocrit levels in pregnant women with anemia can be raised by routinely ingesting 110 grams of papaya daily along with a Fe pill. This is in line with research that found pregnant women's absorption of iron can be enhanced by vitamin C, either in tablet form or as papaya. Giving pregnant women 100 mg vitamin C tablets with a basic diet of rice, corn, and "Tiwul" boosts iron absorption by 37.5% to 46.0%; however, giving them vitamin C in the form of food (250 grams of papaya) can increase absorption by 42 to 54.2%. 13 Another way to put this is that to lower the prevalence of anemia in expectant mothers, iron-rich foods like papaya must be given in addition to the iron tablets that are provided. In addition to iron and vitamin C (78 mg/100 g of papaya), papaya aids in the body's absorption of iron. To facilitate easy absorption of iron, vitamin C converts ferric iron (Fe 3+) into ferrous iron (Fe 2+) in the colon. Furthermore, vitamin C can raise stomach acid and improve iron absorption by as much as 50%. Papayas, which are high in vitamin C, are therefore beneficial for preventing anemia (50).

Role of papaya leaf juice for lactation:

90% of respondents have increased prolactin hormone levels after consuming papaya leaf juice. The average increase of the prolactin hormone is 19.59 ng/ml. The increase of prolactin hormone can occur in just several minutes after breastfeeding; the 16 infants' suction reflex helps to stimulate the production of prolactin hormone (28). The papaya leaves contain the carpinine alkaloids carpinine, pseudocarpaine, dehydrocarpaine I, and dehydrocarpaine II; vitamins B, C, and E; and the minerals Zn, Ca, Fe, K, Na, and Mg. The phytochemical profile of the *Carica papaya* reveals the presence of phytocompounds that are active with pharmacological, alkaloid, phenolic, and amino acid properties. The decreased viscosity of breast milk counteracts the growing number of nursing moms who drink papaya leaf juice. Between days 9 and 12 after intake, the breast milk (foremilk) gets thinner and whiter. The study assumed that papaya leaves may help moms consume less fat. While both varieties of breastmilk are acceptable to feed to newborns, thin breastmilk has more protein and lactose, while thick breastmilk (hindmilk) has more fat. Experiencing discomfort during nursing and a reduction in prolactin hormone levels have generated stress for the responders. This disease then hinders the production of breastmilk, which causes moms to lose confidence as their breastmilk production declines. The woman who drank papaya leaf juice twice a day saw an improvement in her baby's weight. One measure of a baby's growth, whether it proceeds smoothly or not, is the gain in weight. Additionally, the baby's nutritional condition is determined by their weight (28).

RESULT:

Role of unripe Carica papaya in pregnancy:

The present study investigated the potential teratogenic effects of *Carica papaya* latex on fetal development, revealing significant morphological alterations and growth parameters. The extract's anti-implantation action and abortifacient or fetal resorptive qualities are suggested by the rise in post-implantation loss seen with the extract(37).

Role of Carica papaya on ovulation:

Estrous Cycle Disruption: Unripe papaya has been demonstrated in rat studies to interfere with the estrous cycle and perhaps lower fertility. Potential as a Contraceptive: Studies indicate that some parts of unripe papaya, like the seeds and latex, may have antifertility effects by affecting the uterine lining and lowering progesterone levels.

Role of Carica papaya on haemoglobin level during pregnancy:

The results of this study demonstrated that pregnant women with anemia can improve their hemoglobin and hematocrit levels by regularly consuming 110 grams of papaya daily along with a Fe tablet. Another way to put this is that in order to lower the incidence of anemia in pregnant women, iron-rich foods like papaya must be given in addition to the iron tablets that are provided (50).

Role of papaya leaf juice for lactation:

Giving papaya leaf juice to nursing and working mothers has been shown to increase the prolactin hormone levels and the weight of the resulting child. As a galactagogue, papaya leaf juice can support nursing moms (28).

Conclusion:

The review of *Carica papaya's* effects on pregnancy, ovulation, hemoglobin levels, and breastfeeding highlights the critical differences between ripe and unripe forms of the fruit, emphasizing the importance of ripeness and timing in clinical recommendations.

Ripe papaya is safe and nutritious during pregnancy when consumed in moderation, providing essential nutrients for maternal health and fetal development. In contrast, unripe papaya is risky due to its high latex and enzyme content, which can lead to uterine contractions and potential miscarriage. Unripe papaya also has antifertility properties and disrupts hormonal levels, with its seeds showing anti-implantation activity; more research is needed to establish safe dosing for contraceptive use.

Regular consumption (110 grams daily) of ripe papaya, combined with iron supplementation, significantly improves hemoglobin levels in pregnant women with anemia, enhancing iron absorption due to its high vitamin C content. Additionally, papaya leaf juice is an effective galactagogue, increasing prolactin levels and enhancing breast milk volume and infant weight gain.

Short-term (less than five days) use of papaya leaf juice is generally safe, but caution is advised in pregnancy and liver conditions due to possible herb-drug interactions and long-term safety concerns. Healthcare providers should promote ripe papaya for pregnant and lactating women for its nutritional benefits while advising against unripe papaya during pregnancy. Papaya leaf juice can be recommended as a galactagogue for mothers with low milk production, ensuring proper monitoring.

REFERENCE:

1. 1: Adebiyi A, Adaikan PG, Prasad RN. Papaya (Carica papaya) consumption is unsafe in pregnancy: fact or fable? Scientific evaluation of a common belief in some parts of Asia using a rat model. British Journal of Nutrition. 2002 Aug;88(2):199-203.
2. 2: Abdulazeez A, Ameh DA, Ibrahim S, Ayo J, Ambali SF. Effect of fermented and unfermented seed extracts of Carica papaya on pre-implantation embryo development in female Wistar rats (Rattus norvegicus). Sci. Res. Essays. 2009 Oct 1;4:1080-4.
3. 3: Adebiyi A, Adaikan PG. Effect of Crude Papaya Latex on Rats' Pregnancy. Novel Compounds from Natural Products in the New Millennium: Potential and Challenges. 2004 Oct 18:123.
4. 4: Abdulazeez MA, Sani I. Use of fermented papaya (Carica papaya) seeds as a food condiment, and effects on pre-and post-implantation embryo development. InNuts and seeds in health and disease prevention 2011 Jan 1 (pp. 855-863). Academic Press.
5. 5: Adaikan PG, Adebiyi A. Mechanisms of the oxytocic activity of Papaya proteinases. Pharmaceutical Biology. 2005 Jan 1;42(8):646-55.
6. 6:Adigwe CC, Oremosu AA, Gbotolorun SC, Kuseiju TO, Akang EN, Noronha CC, Okalanwon AO. Effects of the alcoholic root extract of the male Carica papaya on ovulation, gestation and fetal parameters in female Sprague-Dawley Eliagita C, Kuntjoro T, Sumarni S, Suwondo A, Hadisaputro S, Eliagita C, Mulyantoro DK.
7. 7: Airaodion AI, Ekenjoku JA, Ogbuagu EO, Okoroukwu VN, Ogbuagu U. Carica papaya leaves might cause miscarriage. Asian Research Journal of Gynaecology and Obstetrics. 2019;2(2):1-9.
8. 8: Altahira S. Utilization of Local Papaya In Second-trimester Pregnant Women Toward The Breast Milk (ASI) Quantity In Kontunaga District, Muna Southeast Sulawesi 2019.
9. 9:Ansah C, Appiah JA, Mensah K, Mante P. Aqueous leaf extract of Carica papaya (Caricaceae) Linn. causes liver injury and reduced fertility in rats. International Journal of Pharmacy and Pharmaceutical Sciences. 2016;8:261-5.
10. 10: Anuar NS, Zahari SS, Taib IA, Rahman MT. Effect of green and ripe Carica papaya epicarp extracts on wound healing and during pregnancy. Food and Chemical Toxicology. 2008 Jul 1;46(7):2384-9.
11. 11: Adebiyi A, Adaikan PG, Prasad RN, Ng SC. Uterine stimulating effects of crude latex of Carica papaya L.(With reference to its indigenous use as an abortifacient). Ethnobiology and Biocultural Diversity (eds Stepp, JR, Wyndham, FS, Zarger, RK). 2002:299-306.
12. 12: Bai MK, Ogasawara H. The Effect of Feeding Papaya Vegetables on Breast Milk Production in Breastfeeding Mothers. Journal of Health Science Community. 2021 Aug 14;2(1):31-9.
13. 13: Chairiyah R, Wiratmo PA. Effect of Papaya Juice on Constipation in Pregnant Women: Quasi-Experimental Study. Journal of Nursing and Midwifery Sciences. 2025 May 29;4(1).
14. 14:Cherian T. Effect of papaya latex extract on gravid and non-gravid rat uterine preparations in vitro. Journal of Ethnopharmacology. 2000 Jul 15;70(3):205-12.
15. 15: Dela Cruz ME, Babani AP, Lu AJ, Del Rosario RK, Inson JG. Anti-fertility Potential of Carica papaya L.(Pawpaw) in Males.
16. 16: Ekong MB, Akpan MU, Ekanem TB, Akpaso MI. Morphometric malformations in fetal rats following treatment with aqueous leaf extract of Carica papaya. Asian Journal of Medical Sciences. 2011 May 14;2(1):18-22.
17. 17: Ekhator CN, Shelu JO. An experimental study on the abortificient potentials of unripe seed extract of Carica papaya in Adult Female Wistar Rats.
18. 18: Eppang Y. The Relationship Between Papaya Consumption During Pregnancy and Smooth Breast Milk Production in Postpartum Mothers in the Work Area of UPT Puskesmas Bontonompo 1, Gowa Regency. Indonesian Journal of Nursing and Health Care. 2024 Aug 8;1(2: Agustus):42-5.
19. 19: Ellen Pesak EP, Losu FN, Losu FN, Robin Dompas RD, Freike Lumy FL, Gusti Ayu Tirtawati GA, Dian Pratiwi DP, Kusmiyati K, Djojobo FA, Djojobo FA, Atik Purwandari AP. Impact of Papaya (Carica papaya L.) on Breast Milk Production Enhancement of Nursing Mothers at Teling Atas Public Health Center, Wanea Subdistrict, Manado City. Impact of Papaya (Carica papaya L.) on Breast Milk Production Enhancement of Nursing Mothers at Teling Atas Public Health Center, Wanea Subdistrict, Manado City. 2021 Jun 7.
20. 20: Estella OU, Ogoamaka OP, Emmanuel EF. Evaluation of the oxytocic and haematogical effects of leaves of Carica papaya Linn (Caricaceae). World Journal of Advanced Research and Reviews. 2020;6(2):212-26.
21. 21: Goi M. The Effect of Papaya Juice Intake on The Control of Hemoglobin Level among Pregnant Women in Gorontalo. InThe International Conference on Public Health Proceeding 2019 Feb 14 (Vol. 4, No. 01, pp. 356-356).
22. 22: Gopalakrishnan M, Rajasekharasetty MR. Effect of papaya (Carica papaya linn) on pregnancy and estrous cycle in albino rats of Wistar strain. Indian Journal of Physiology and Pharmacology. 1978 Jan 1;22(1):66-70.
23. 23: Herawati M, Mashoedi ID, Hadisaputro S. Effect of Carica Papaya Linn on Changes in Ferritin Levels of Anemia Pregnant Women Who Consume Iron Tablets. Work.;61(53):0-153.
24. 24: Hakameri CS. Effect of Young Papaya (Carica papaya L.) Fruit Extract on Infiltration of Endometrial Inflammatory Cells of Female Rats (Rattus norvegicus). Science Midwifery. 2021 Mar 16;9(2):270-3.
25. 25: Hakameri CS, Usman E. Effect of giving young papaya (Carica papaya L.) fruit extract on endometrial histology of female rats (Rattus norvegicus). Science Midwifery. 2020 Oct 31;9(1, Oktober):181-6.
26. 26: Hossain KM, Hossain MA, Ashraf A, Alam MM. ABORTIC EFFECT OF PAPAYA (Carica Papaya) IN FEMALE MICE. Khulna University Studies. 2002 Nov 30:762-4.
27. 27: Hutahayan M, Herawati I. Effectiveness Of Young Papaya Book Consumption To Increasing Breast Milk Production In Breastfeeding Mothers. International Journal of Health and Pharmaceutical (IJHP). 2023 Feb 7;3(3):538-44.
28. 28: Ikhlasiah M, Winarni LM, Poddar S, Bhaumik A. The effects of papaya leaf juice for breastfeeding and working mothers on increasing prolactin hormone levels and infant's weight in Tangerang. Enfermeria clinica. 2020 Jun 1;30:202-5.

29. 29: JP J, Doss VA. Evaluation of Uterotonic Activity of Hydro-ethanolic Extract of Unripe Fruit of Carica papaya Linn using Wistar Albino Rats. Indian Journal of Pharmaceutical Education & Research. 2017 Oct 2;51.

30. 30: Keshri G, Singh MM, Lakshmi V, Gupta DN, Kamboj VP. Post-coital antifertility activity of the seeds of Carica papaya linn in female rats. INDIAN DRUGS-BOMBAY-. 1993;30:453-.

31. 31:Mareta EW, Suwondo A, Djamaluddin I. Comparison Of Effectiveness Benefits Of Providing Young Papaya Fruit Extract And Breast Care For Normal Postpartum Mother's Breast Milk Production: Systematic Review. STRADA Jurnal Ilmiah Kesehatan. 2020 Nov 1;9(2):1141-50.

32. 32:Mawaddah S. Effectiveness of Papaya (Carica papaya) Leaf Extract Pills to Increase Breast Milk Production among Breasfeeding Women at Private Practice Midwife M Palangka Raya. EMBRIO: Jurnal Kebidanan. 2022 Nov 4;14(2):250-4.

33. 33: Memudu AE, Oluwole TJ. The contraceptive potential of Carica papaya seed on oestrus cycle, progesterone, and histomorphology of the Utero-ovarian tissue of adult wistar rats. JBRA Assisted Reproduction. 2021 Jan;25(1):34.

34. 34: Morakinyo, A. O., Awobajo, F., Oloyo, A., Raji, Y., Akinsomisoye, O. S., Kunle-Alabi, O. T., & Esegbue-Peters, P. R. (2005). Impact of chloroform extract of Carica papaya seeds on estrous circle and fertility in female albino rats.

35. 35: Nagesh C, Narapogu V, Kumar R, Ksheerasagar VK. Effect of Carica papaya raw fruit extract using in vitro rat uterus preparations. Asian Journal of Medical Sciences. 2023 Aug 1;14(8):60-4.

36. 36: Nahak KA, Simanihuruk R, Ampu MN. Effectiveness of Giving Papaya Leaf on The Fluence of Breast Milk in Breastfeeding Mothers at Nimasi Health Center at The Year of 2022. Science Midwifery. 2022 Dec 8;10(5):4072-9.

37. 37: Odirichukwu EO. Effects of aqueous methanolic extract of unripe Carica papaya fruit on midterm pregnancy in Wistar albino rats. Journal of Veterinary Advances. 2015;5(6):962-7.

38. 38: Odirichukwu EO, Uchechukwu NV, Ogwu D. The Aqueous Methanolic Extract of Unripe Carica Papaya (Pawpaw) Fruit Distrupts Oestrous Cycle in Albino Rats. IOSR J Agric Vet Sci. 2016;9:57-62.

39. 39: OYELOWO O. EFFECTS OF CHLOROFORM EXTRACT OF CARICA PAPAYA SEED ON PREGNANCY OUTCOME AND POSTNATAL DEVELOPMENT IN RATS (Doctoral dissertation).

40. 40: Oyelowo OT, Raji Y, Bolarinwa AF. In–utero exposure to ripe Carica papaya seed resulted in postnatal outcomes from only first and second trimesters in rats. Int J Adv Res. 2014;2:254-66.

41. 41: Pesak E, Losu FN, Dompas R, Lumy F, Tirtawati GA, Pratiwi D, Kusmiyati K, Djojobo FA, Purwandari A, Bongakaraeng B, Legi NN. (Uji Similarity) Impact of Papaya (Carica papaya L.) on Breast Milk Production Enhancement of Nursing Mothers at Teling Atas Public Health Center, Wanea Subdistrict, Manado City. Macedonian Journal of Medical Sciences. 2021 Jun 7.

42. 42: Raji Y. Impact of the Chloroform Extract of Carica papaya Seed on Oestrous Cycle and Fertility in Female Albino Rats* Y. Raji," AO. Morakinyo," AK. Oloyo," OS Akinsomisoye," Olufadekemi, T. Kunle-Alabi," PRC Esegbue-Peters and "FO. Awobajo. J. Med Sci. 2005 Oct;5(4):337-43.

43. 43: Raji Y, Morakinyo AO, Akinsomisoye OS, Oloyo AK, Esegbue-Peters PR, Kunle-Alabi OT. Evaluation of the abortifacient properties of chloroform extract of Carica papaya L seed in female albino rats.

44. 44: Schmidt H. Effect of papain on different phases of prenatal ontogenesis in rats. Reproductive Toxicology. 1995 Jan 1;9(1):49-55.

45. 45: Setiawan H, Wulandari SW, Nurwidyantary FE, Dewantari I. The effects of Calina papaya leaf ethanol extract on estrus cycle and uterus morphology of wistar rats. Biosaintifika: Journal of Biology & Biology Education. 2021 Dec 10;13(3):305-12.

46. 46: Sumanth M, Ugendra K. EFFECT OF UNRIPE CARICA PAPAYA ON UTERUS. International Journal of Research in Ayurveda & Pharmacy. 2013 May 1;4(3).

47. 47: Tossawanchuntra G, Aritajat S. Effect of aqueous extract of Carica papaya dry root powder on lactation of albino rats. InIII WOCMAP Congress on Medicinal and Aromatic Plants-Volume 4: Targeted Screening of Medicinal and Aromatic Plants, Economics 678 2003 Feb 3 (pp. 85-90).

48. 48:Victor PD, Ordu KS, Ogaree TB, Nkoju TC, Allison T, Ajie PC, Wami-Amadi CF, Okpara PE, Reuben E, Ekokodje JW, Dan-Jumbo D. The Effects of Ethanolic Extract of Premature Carica papaya (Pawpaw) Fruits on the Reproductive System of Female Wistar Rats. Sch Int J Anat Physiol. 2023;6(3):18-27.

49. 49: Wahyutri E, Urnia EE. IMPROVEMENT OF MOTHER'S BREAST MILK PRODUCTION THROUGH PAPAYA FRUIT DESSERT. INTERNATIONAL JOURNAL OF NURSING AND MIDWIFERY SCIENCE (IJNMS). 2023 Nov 3;7(2A):57-63.

50. 50: Effect of consuming papaya (Carica papaya Linn.) on the level of hemoglobin and hematocrit in pregnant women with anemia. Belitung Nursing Journal. 2017 Apr 28;3(2):120-5.rats. Journal of Medicinal Plants Research. 2012 Apr 30;6(16):3093-7.