ORIGINAL ARTICLE

PHYTOCHEMISTRY AND STUDY OF ANTIFERTILITY EFFECTS ON EUGENOL AND *OCIMUM SANCTUM* LINN. LEAF EXTRACT IN FEMALE RAT

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ABSTRACT

Background: The purpose of this study is to investigate the antifertility activity of Eugenol (EUG) and *Ocimum sanctum* (*OS*) Linn. Leaf extract in female albino rats. **Objective:** This research was conducted to investigate the effects of Eug and *OS* in Phytochemistry and evaluate antifertility activities in female rats. **Methods:** Experiments are carried out to investigate healthy female albino rats given with Eug (99% pure) with a dose of 0.4 ml/day/ rat and *OS* Linn. (Tulsi) Leaf extract at a dose of 500 mg/kg body weight/day/rat orally for 15 days. Different parameters study in female albino rats, including the estimated hematological and biochemical parameters, observed. **Results:** Data revealed that the administration of Eugenol and *Ocimum sanctum* Linn. Extract leaf physicochemical parameters are determined. Phytochemical analysis of plant leaves reveals that the existence of saponins, alkaloids, flavonoids, steroids, phenols, tannins and glycosides. In hematological assessment, the average concentration of WBC, BT, CT, LYS, MON, NEU and PLT significantly ($p<0.01$) increased in Eug and OS compared to control. Biochemical assessment shows a significant increase ($p <0.05$) at the Creatinine, Urea, Total Bilirubin and Albumin and Alkaline Phosphates on Eug and *OS*, compared to control. **Conclusions:** These results indicate that Eugenol and *Ocimum sanctum* Linn. Leaf extract must be given carefully because it can cause some infertility levels in female animals.
Key words: *Eugenol, Ocimum sanctum , antifertility, phytoconstituents, hematological, biochemical.*

1. INTRODUCTION

The extraordinary growth of the world population stands as one of the significant events of the modern era to think about. The current world population is around 6.46 billion and especially in India is around 1.1 billion. One of the critical problems of developing countries such as in India is a geometric increase in the human population. The increasing population is one of the biggest problems faced by most countries, with unavoidable consequences for all aspects of development, especially work, education, housing, health care, sanitation and the environment [1]. Worldwide now recognizes the need for fertility planning. Fertility regulations with plants or plant preparations and drugs have been mentioned in the ancient texts of the traditional drug system of many countries [2-4]. The use of plants as abortion, emmenagog, and local contraception in various countries in the world have been comprehensively understood recently [5]. Today's synthetic contraceptive agents available produce side effects such as hormonal imbalances, hypertension, increased risk of cancer and weight gain [6]. Therefore, factory-based alternative searches are safe, effective and active are very desirable for fertility regulations.

Ocimum sanctum L. Is said to have an abortion effect on women. *Ocimum sanctum* L. Also has an antifertility effect. In Kerla, local women and Ayurvedic doctors have been reported using Tulsi leaves for the effects of infertility. Benzene extract and petroleum ether leaves *Ocimum sanctum* L. Have reportedly produced 80% and 60% of infertility activities, respectively in female rat [7]. *Ocimum sanctum* is also known as the Tulsi Family of the *Ocimum sanctum* is Laminaceae. *Ocimum sanctum* is produced in India and Southeast Asia, India is the largest source of drug plants throughout the world. Herbs have been given the therapeutic potential for individual health. The demand for this plant increases day by day for the purpose of the drug [8]. The use of *Ocimum sanctum* plants as drugs in the tradition of ancient medicine and suggests that some plant extracts have antimicrobial compounds. cirsilineol, circimaritin, isothymusin, apigenin and rosameric acid, present in an isolated water extract from ozimum sanctum which may be useful for fever, sypylitic, ulcers, inflammatory disease wounds, such as antimicrobial infections, analgesics, anticancer, eye disease, anticancer, eye disease, Antifertility, hepatoprotective, chronic fever, antispasmodic, antiemetic, cardio protector etc. In the protective antioxidant supplement the *Ocimum sanctum* leaf extract can be used after a specific test analysis. After this study is assumed that extracts can be used for new formulations and strong antimicrobial drugs from natural origin [9].

The compounds in the hydroal experiment of *Ocimum sanctum* are identified by GC-MS analysis (**Figure 1**). Active principles with their retention time (RT), molecular formula, molecular weight (MW) and concentration (%). Ten compounds were identified in hydroalhol extracts by GC-MS. The main components in the leaf of *Ocimum sanctum* are Eugenol (43.88%), Caryophyllene (26.53%), Cyclopentane, Cyclopropylidene-(1.02%), Cyclohexane, 1,2,4-triethenyl (15.31%), octadecane,1,1-dimethoxy-(2.04%) and Benzene methanamine, N,N,a,4-tetramethyl-(2.04%).

Phytochemical constituents that contribute to drug activities from a hydroalhol extract from *Ocimum sanctum* . Leaves contain eugenol and caryophilline are considered especially responsible for various antimicrobial properties. Eugenol is the main constituency and is responsible for its rejection property. The presence of the Eugenol attributes with its antioxidator and is also considered responsible for inhibition of lipid peroxidation [8].

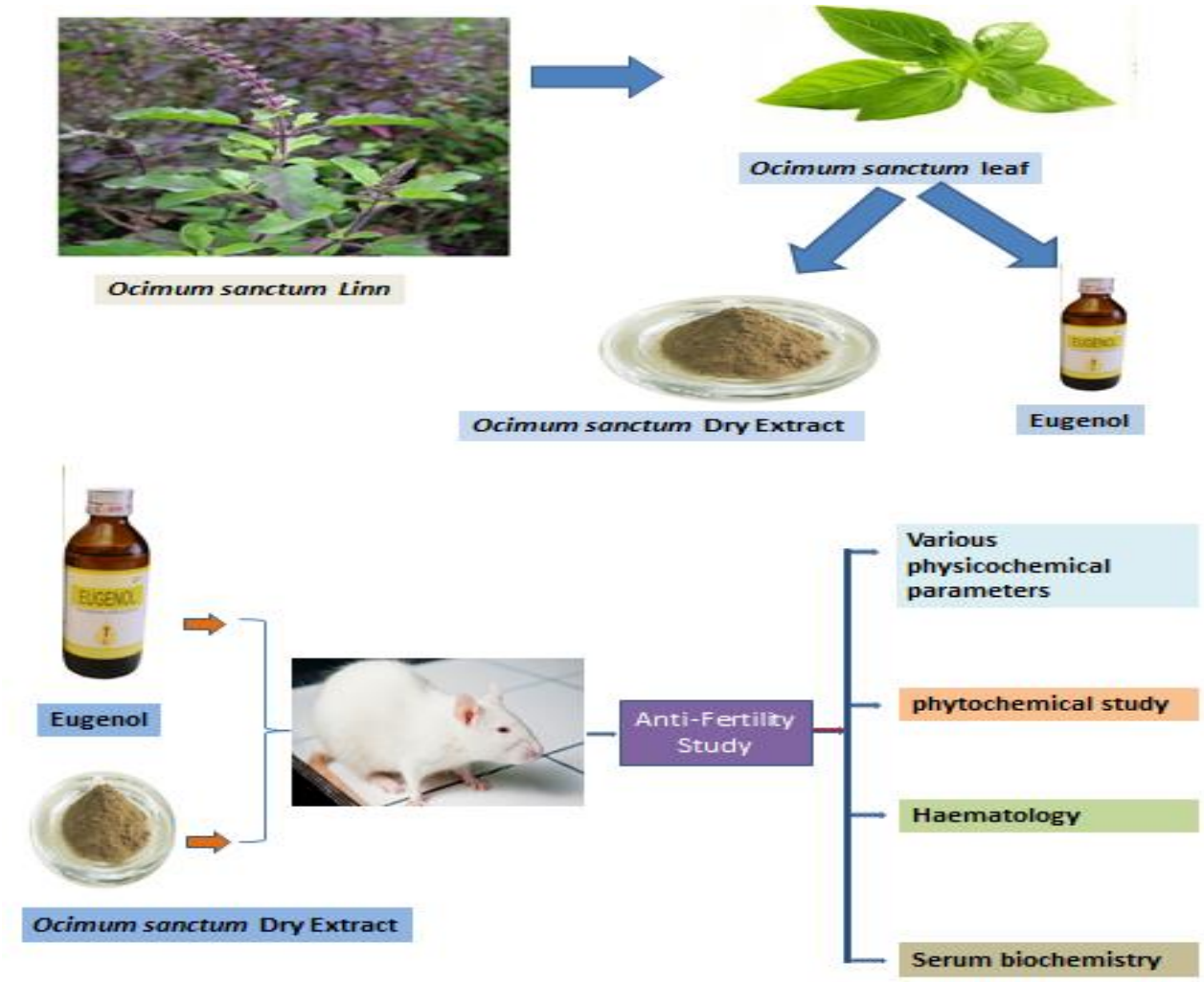
Eugenol (1-allyl-3-methoxy-4-hydroxybenzene) is the main constituent of essential oils extracted from dry flower buds from clove trees (Eugenia caryophyllata). Clove essential oils contain around 88% eugenol; Other compounds include eugenyl acetate, humulenol, a-humulene, b-caryophyllene, calacorene, calamenene, 2-heptanone, and ethyl hexanoate [10].

To understand the Mode of Action *Ocimum sanctum* L., to explain its therapeutic potential in managing various conditions of the disease and to establish its use in modern medicine, some investigations have been made to study the pharmacological actions of eugenol, important oil (extracted from Tulsi leaves) & Tulsi extract on the immune system body, central nervous system, gastric system, reproductive system, blood biochemistry etc. In experimental animals [11].

Highlights

- ✓ The antifertility activity of Eugenol (Eug) and Ocimum Sanctum (OS) Linn. Leaf extrac in female albino rats.
- ✓ The administration of Physicochemical phytoconstituents, hematological; biochemical parameters of Eugenol and Ocimum Sanctum Linn. Leaf extract was determined
- ✓ Eugenol and Ocimum Sanctum Linn. Leaf extract appears to have no such potential of inducing anaemia. .
- ✓ The results might also indicate that the capacity of hepatic cells to excrete bilirubin was not adversely affected by the extract.

Graphical abstract



2. MATERIALS AND METHODS

2.1 Plant collection and identification

Healthy, disease-free, mature leaves from *Ocimum sanctum* (Tulsi) are collected from the Hills Seshachalam area are a hilly part of the Eastern Ghats in the state of South Andhra Pradesh, in Southeast India. Plant material collected was

identified and confirmed by the Indian botanical survey, Hills Seshachalam area are a hilly part of the Eastern Ghats in the state of South Andhra Pradesh, in Southeast India, where voucher samples were preserved.

2.2 Determination of physicochemical parameters

Eugenol and *Ocimum sanctum* Linn. Leaf extract in physicochemical parameters is determined and reported as total ash, water-soluble ash, acid-insoluble ash. The extractive value of alcohol and water soluble is determined to determine the amount of water soluble and alcohol components. Moisture content and pH were also determined are also determined (Edwin, 2010) [12].

2.3 Leaf preparation

The chosen plant leaves are picked and washed thoroughly with tap water running. It was washed with sterile distilled water to remove dirt before the drying process. The leaves were dried in the shade room temperature for a week to eliminate water content and powder using caregivers of mixers. Finally, powder samples are stored at room temperature for further study.

2.4 Preparation of plant extracts

2.5 g powder samples are taken in airtight bottles. For this, 50 ml of different solvents such as ethanol, methanol, acetone and distilled water is added. After 2 days, the contents were stirring well and filtered using WHATMANN no.1 filter paper. The filtrate is collected and stored in a sterile bottle at 4°C for further use. For antibacterial studies, each extract is prepared by dissolving 250 mg in 5 ml of 10% (v/v) aqueous dimethyl sulphoxide (DMSO).

2.5 Phytochemical analysis

The newly prepared leaf extract was subject to standard phytochemical analysis using standard procedures [13]. To find out the existence of various phytoconstituents such as alkaloids, terpenoids, flavonoids, tannins, steroids, anthroquinones, saponins, resins, glycosides and phenols.

2.6 Chemical test

Eugenol (99%) pure compound was purchased from Sigma Aldrich (St Louis).

2.7 Experimental animals

Antifertility experiments are carried out in female albino rats weighing around 170 ± 20g. They have been received from animal residence from Sri Venkateswara University. Rats were purchased from Sri Raghavendra Enterprises, Bangalore, India. The animals are located in a clean polypropylene enclosure in hygienic conditions in a well-ventilated air-conditioned room, with a 12 h photoperiod and 12 hours of dark cycles, at 25^{o}C ± 2ºC with relative humidity of 50% ± 5%. The use of animals is accredited by the Institutional Animal Ethics Committee (IAEC) (Regd. No. 10(i)a/CPCSEA/IAEC/SVU/ZOOL/CC/ Dt.08-07-2012) at Sri Venkateswara University, Tirupati, India.

2.8 Dose and route of administration

Group I: The first experimental group was controlled by the administration of rats with 1 ml of saline (Vehicle).

Group II: The second experimental group, was administered with Eug pure compound (99%) at the dose 0.4 ml/day for 20 days with intramuscular injection.

Group III: The third experimental group, was administered with OS leaf extract at the dose 500 mg/kg body weight/day for 20 days orally by using gastric destruction techniques [14,15].

2.9 Hematological assessment

Blood samples from experimental animals are collected into bottles of Ethylenediaminetetraacetic acid and RBC: red blood cells; WBC: White blood cells; Hb: hemoglobin; BT: Bleeding time; CT: Clotting time; HCT: hematocrit; MCV: means corpuscular volume; MCH: Mean Corpuscular Hemoglobin; MCHC: The average concentration of corpuscular hemoglobin; Lym: lymphocytes; Monday: monocyte; NEU: Neurtophils; Acting: platelets. Determined using the automatic hematological analyzer.

2.10 Biochemical assessment

Blood samples collected in ordinary bottles are allowed to gather for 30 minutes, and serum is separated by centrifugation. Serum samples were analyzed for liver enzymes and other biochemical markers by Roche and Cobas commercial kits and a Roche-Hitachi 904, chemical analyzers (MedTech Trade AG, Uster, Switzerland) and serum concentrations of sodium and potassium were determined using the method of Tietz et al. (1986) [16].

2.11 Statistic analysis

Data analyzed statistically using one-way ANOVA and TUKEY'S POST HOC RESPONSE TEST. The value on ($P < 0.05$) is considered significant. Graphpad Prism 6.0 (Graphpad Software Inc., San Diego, CA, USA) is used in the data analysis.

Figure 1: *Ocimum sanctum*

Figure 2: Fresh leaves

Figure 3: Powder form of *Ocimum sanctum*

3. RESULTS

3.1 Physicochemical parameters

Physical parameters on Eugenol and OS are determined **(Table 1).**

Table 1: Various physicochemical parameters

Physicochemical parameter	Value % w/w* Mean± SD.
Total Ash	19.58±1.52
Acid insoluble ash	9.73±0.64
Water soluble ash	3.64±0.28
Water soluble extract	15.32±1.13
Ethyl alcohol soluble extract	17.9±1.27
Moisture content	2.4±0.13
pH	6.7±0.52

w/w*: weight/weight Value (%); Mean ± SD.

3.2 Qualitative Phytochemical Analysis

Ethanol, Methanol, Acetone, and distilled water extract on *Ocimum sanctum* found containing Alkaloids,Terpenoids, Flavonoids, Tannins, Steroids, Anthraquinones, Saponins, Resins, Glycosides, Phenols. The main components in the *Ocimum sanctum* leaf are Eugenol, Caryophyllene, Cyclopentane, Cyclopropylidene, Cyclohexane, 1,2,4-triethenyl, octadecane,1,1-dimethoxy and Benzene methanamine, N,N,a,4-tetramethyl **(Table 2 & 3).**

Table 2: Preliminary phytochemical study of *Ocimum sanctum* leaf extracts

No.	Compounds	Test Adopted	*Ocimum sanctum*			
			Ethanol Extract	Methanol Extract	Acetone Extract	Aqueous Extract
1	Alkaloids	Mayer's Test	+	+	+	+
2	Terpenoids	Salkowski Test	+	+	+	+
3	Flavonoids	Sodium hydroxide Test	+	+	-	-
4	Tannins	Lead Acetate Test	+	+	-	+
5	Steroids	Chloroform Test	+	+	-	+
6	Anthraquinones	Free anthraquinones Test	-	-	-	-
7	Saponins	Foam Test	+	+	-	+
8	Resins	Sodium hydroxide Test	+	+	+	+
9	Glycosides	Keller Killiani's Test	+	+	+	-
10	Phenols	Ferric chloride Test	+	+	+	+

+ = Present; - = Absent

Table 3: Components identified in the *Ocimum sanctum* leaf extract.

No.	RT	Name of the compound	Molecular Formula	MW	Peak Area %
1.	6.12	Eugenol	$C_{10}H_{12}O_2$	164	43.88
2.	6.56	Cyclohexane, 1,2,4-triethenyl-	$C_{12}H_{18}$	162	15.31
3.	6.99	Caryophyllene	$C_{15}H_{24}$	204	26.53
4.	7.73	10-Heptadecen-8-ynoic acid, methyl ester, (E)-	$C_{18}H_{30}O_2$	278	1.02
5.	8.99	Cyclopentane, cyclopropylidene-	C_8H_{12}	108	1.02
6.	14.95	Z,Z-4,16-Octadecadien-1-ol acetate	$C_{20}H_{36}O_2$	308	1.02
7.	20.49	Benzene methanamine, N,N-a,4-tetramethyl-	$C_{11}H_{17}N$	163	2.04
8.	20.85	3′,8,8′-trimethoxy-3-piperidyl-2,2′-binaphthalene-1,1′,4,4′-tetrone	$C_{28}H_{25}NO_7$	487	1.02
9.	24.36	Octadecane, 1,1-dimethoxy-	$C_{20}H_{42}O_2$	314	2.04
10.	24.71	Pentanedinitrile, 2-methyl-	$C_6H_8N_2$	108	6.12

3.3 Effects on hematological parameters

Eugenol and OS effect of hematological parameters in female rats. However, there was significant ($p<0.05$) increased WBC, BT, CT, LYM, MON, NEU, PLT compared to control. RBC, Hb, HCT, MCV, MCH, MCHC significantly ($p<0.05$) decreases compared to control. **(Table 4).**

Table 4: Effect of Eugenol and *Ocimum Sanctum* Linn. Leaf extract on Haematology parameters in female rats.

No	Tests	Control	Eugenol administration	*OS* administration
1	RBC(mill/mcl)	9.71±0.63	8.47±0.54	8.63±0.61
2	WBC(thous/mcl)	11.46±1.02	14.35±1.26	15.47±1.38
3	Hb(g/dl)	18.03±1.68	13.24±1.19	14.61±1.29
4	BT(sec)	81±6.84	89±7.35	87±7.08
5	CT(sec)	40±3.27	52±4.48	51±4.19
6	HCT (%)	43.12±3.36	39.93±2.93	40.86±3.34
7	MCV(fl)	67.35±5.83	53.27±4.61	54.83±4.74
8	MCH(pg)	26.52±1.82	20.35±1.47	21.64±1.65
9	MCHC (%)	44.98±3.21	41.02±3.08	41.17±3.16
10	LYM (%)	51±4.37	59±4.74	57±4.53
11	MON (%)	4±0.31	14±0.98	13± 0.87
12	NEU (%)	44±3.39	74±6.53	73±6.48
13	PLT ($x10^9$/L)	476.00±38.03	642.00±55.71	663.00±58.64

Values are mean ± SEM; n=6 in each group; *Values are statistically significant at P< 0.05.

RBC: red blood cells; WBC: white blood cells; Hb: hemoglobin; BT: Bleeding time; CT: Clotting time; HCT: hematocrit; MCV: mean corpuscular volume; MCH: mean corpuscular hemoglobin; MCHC: mean corpuscular hemoglobin concentration; LYM: lymphocytes; MON: monocytes; NEU: neurtophils; PLT: platelets.

3.4 Effect on biochemical parameters

Creatinine, Urea, Total Bilirubin and Albumin, Alkaline Phosphates levels significantly ($p<0.05$) increase compared to control, In Urea, Uric acid and Gamma Glutamyl Transferase levels significantly ($p<0.05$) reduced by control **(Table 5).**

Table 5: Effect of Eugenol and *Ocimum Sanctum* Linn. Leaf extract on Serum biochemistry in female rats.

	Parameters	Control	Eugenol administration	*OS* administration
1	Creatinine (mg/dl)	0.7±0.05	1.0±0.09	0.9±0.07
2	Urea (mg/dl)	19.53±1.03	22.02±1.67	21.62±1.56
3	Uric acid (mg/dl)	6.13±0.49	4.93±0.33	5.28±0.46
4	Total Bilirubin (mg/dl)	0.4±0.02	0.52±0.03	0.49±0.03
5	Albumin (g/dl)	3.7±0.21	3.83±0.25	3.79±0.29
6	Alkaline Phosphates (U/l)	63.29±4.83	161.03±14.79	159.73±13.43
7	Gamma Glutamyl Transferase (GGT) (U/l)	28.68±1.62	22.14±1.28	23.91±1.43

Values are mean ± SEM; n=6 in each group; *Values are statistically significant at P< 0.05.

4. DISCUSSION

Physicochemical parameters

Eugenol and *OS* physicochemical parameters are determined. In physicochemical parameters, total ash is around 2 and 4 times more than acid insoluble ash and water soluble ash, respectively [17]. Extractive ethanol soluble is around 2 times higher than water soluble extractively. Moisture content <2.4% and pH is 6.7 **(Table 1).**

Plant collection and identification

Healthy, disease-free, mature leaves of the *Ocimum sanctum* collected from the Bukit Seshachalam area are part of the Eastern Ghats in the state of South Andhra Pradesh, in Southeast India. **Fig.1** Shows *Ocimum sanctum* Plants with Fresh Leaves. *Ocimum sanctum* is commonly known as Tulsi cultivated for religious purposes and treatment. It is widely known throughout the Indian continent as medicinal plants and herbal tea [18].

Leaf preparation

The fresh leaves of the *Ocimum sanctum* are collected and washed thoroughly with tap water running. It was washed with sterile distilled water to remove dirt before the drying process. After that the leaves were dried in shade at room temperature for a week to eliminate moisture content and powder using a mixer grinder. Finally, powder samples are stored at room temperature for further study. Fresh drying *Ocimum* sanctum leaves are served in **Figs 2&3** [18].

Preparation of plant extracts

The leaf extract from the *Ocimum sanctum* is prepared with four different solvents such as ethanol, methanol, acetone and distilled water. 2.5g leaf powder dissolved in 50ml each solvent. These four leaves extract with different solvents [18].

Phytochemical analysis

The results of the phytochemical composition of the *Ocimum sanctum* Extract are given in **Table 2**. The results of the phytochemical study show that all extracts are tested (ethanol, methanol, acetone and aqueous) contain alkaloids, terpenoids, flavonoids, tannins, steroids, anthroquinones, saponins, resins, glycosides and phenols. Phytochemical analysis reveals that *Ocimum sanctum* contains a rich source of bioactive compounds such as alkaloids, terpenoids, flavonoids, tannins, steroids, anthroquinones, saponins, resins, glycosides and phenols. The Phytochemical is divided into two groups, which are primary and secondary constituents; In accordance with their functions in plant metabolism. The main constituents consist of common sugars, amino acids, proteins and chlorophyll while secondary constituents consist of alkaloids, terpenoids and phenolic compounds [19]. *Ocimum sanctum* leaf extract contains various phytochemical compounds such as saponins, alkaloids, flavonoids, cardiac glycosides, steroids, phenols and tannins [20]. Tanin's presence suggested the ability of this plant to play the main role as an antidiarrhoec agent and antihaemorrhagic [21]. The presence of glycosides has been used for more than two centuries as stimulants in cases of heart failure [22].

Hematological Studies from Eugenol and *OS*

Hematological parameters provide valuable information about animal health status. Eugenol and *Ocimum sanctum* Linn. Leaf extract on hematological parameters in female rats, indications that there is no disruption in the production of red blood cells. Important Red blood cells (RBC) in transporting breathing gas. Hematological Parameters of WBC, RBC, Hb and HCT Values are all found in the normal range [23].
That there is no effect related to treatment on RBC and Hb implies that extracts do not have a negative impact on the capacity of blood oxygen carrier and the amount of oxygen sent to the tissues. The erythrocyte index (MCV, MCH and MCHC) is important in diagnosing anaemia [24]. Some drug plants are known to cause the destruction of red blood cells, which lead to anaemia [25]. Eugenol and *Ocimum sanctum* Linn. Leaf extract does not seem to have the potential to encourage anemia.

The increase in the total WBC count observed shows the upgraded phagocyte function of leucocytes. Platelets play an important role in the hemostasis process and its reduction may affect trombopoietin [26]. Increased number of platelet count following the administration of oral Eugenol and *Ocimum sanctum* Linn. Leaf extract shows that extracts may not cause coagulation problems, but have the potential to increase clotting and prevent haemorrhages. In contrast, the anticoagulants of Eugenol and *Ocimum sanctum* are concluded, because extracts precipitated low platelet levels in circulation [27].

Biochemical Studies from Eugenol and *OS*

The results of the biochemical assessment show that Eugenol and *Ocimum sanctum* Linn. Extract leaves in female rats. Also increasing creatinine levels shows possible nephrotoxicity. Increasing plasma creatinine concentration is associated with the function of disturbed kidney excretion due to pain or toxic insult [28].

Increasing urea levels in the blood can be associated with a high protein diet, dehydration, haemorrhage and severe shock [28]. The increase in urea levels observed in this study, especially in Eugenol and *Ocimum sanctum* Linn. Leaf extract shows disturbed kidney capacity to issue waste products

The total serum bilirubin and the albumin concentration showed the circumstances and severity of the hepatic injury. The normal level of albumin and bilirubin observed in this study indicates that synthetic functions and liver secretions are not disturbed by extracts and can also show that extracts are not entirely hepatotoxic. Albumin concentration in plasma. This transports many substances, including drugs and prevents liquid leakage into the tissues [29]. Increased bilirubin levels, hemoglobin Haeme component products are associated with hemolytic anaemia, billiard obstruction or liver disease. The bilirubin rate specified in this study was not affected by Eugenol and *Ocimum sanctum* Linn. Leaf extract has suggested that there is no destruction of erythrocytes related to treatment. The results may also show that the capacity of hepatic cells to issue bilirubin is not affected by the extract.

It shows that Eugenol and *Ocimum sanctum* Linn. Leaf extract does not have toxic effects on rat physiology. Alkaline phosphatase activity is increased outside the control value [30]. Effects carried by Eugenol and *Ocimum sanctum* Linn. leaf extract Antestrogenic, which causes infertility in female rats.

5. CONCLUSION

The results obtained in this study indicate that it can be concluded that Eugenol and *Ocimum sanctum* Linn. Leaf extract due to its effective antiestrogenic properties changes the biochemical environment from the reproductive tract, which leads to changes in the normal status of reproduction in the reproductive tract of female rat and thus produces significant antifertility effects.

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Contribution statement: PVR: Conceptualization, Investigation, Methodology, Funding acquisition, Writing - original draft. MSR: Conceptualization, Supervision.

6. REFERENCES

1. Shah GM., Khan MA., Zafar MAM., Khan AA. Observations on antifertility and abortifacient herbal drugs. *Afr J Biotechnol* 1959; 009(8):64.
2. Kirtikar KR., Basu BD. Indian medicinal plants. 3rd ed. Allahabad: Lalit Mohan Basu 1946.
3. Chopra RN. Chopra's indigenous drugs of India. 2nd ed. Calcutta: Messrs UN Dhur and Sons Ltd 1958.
4. Kamboj VP. AreviewofIndianmedicinalplantswithinterceptiveactivity. *Indian J Med Res*. 1988; 87: 336–55.
5. Kumar D., Kumar A., Prakash O. Potential antifertility agents from plants: a com-prehensive review. *J Ethnopharmacol* 2012; 6: 1–32.
6. Namara JO Mc. Drugs effective in the treatment of the epilepsies. In: Hardman JG., Limbird JE., Molinoff PB., Ruddon RW., Gillman AG., editors. Goodman and Gillman's the pharmacological basis of therapeutics. 9th ed. New York: McGraw Hill 1996. p. 461–86.
7. Batta SK., Santhakumari G. The antifertility effect of *Ocimum sanctum* and Hibiscuc Rosa Sinensis. *Indian J Medical Research*. 1971; 59: 777–781.
8. Gupta SK., Prakash J., Srivastava S. Validation of traditional claim of Tulsi., Ocimum sanctum Linn., as a medicinal plant. Indian J *Exp Biol*. 2002; 40: 765-773.
9. Panchal P., Parvez N. Phytochemical analysis of medicinal herb (ocimum sanctum). *Int J Nanomater Nanotechnol Nanomed* 5(2); 2019. 008-011.
10. Chaieb K., Hajlaoui H., Zmantar T., Kahla-Nakbi AB., Rouabhia M., Mahdouani K., and Bakhrouf A. The chemical composition and biological activity of clove essential oil., Eugenia caryophyllata (Syzigium aromaticum L. Myrtaceae): a short review. *Phytother Res*. 2007; 21: 501–6.
11. Khanna N., Bhatia J. Action of *Ocimum sanctum* (Tulsi) in mice: possible mechanism involved. *J Ethnopharmacology*. 2003; 88(2–3); 293–296.
12. Edwin Jarald E., Sheeja Edwin Jarald. Textbook of Pharmacognosy and Phytochemistry 2009; 1: 469–470.
13. Trease GE., Evans WC., Pharmacognosy., WB. Scandars Company Ltd. London 1989; 14: 269-300.
14. Shankar Mondal., Bijay R., Mirdha and Suhil C., Mahapatra. The science behind sacredness of tulsi (*Ocimum sanctum* Linn). *Indian J Physiol Pharmacol*. 53 (4) (2009) 291–306.
15. Kulkarni D. Eugenol induced changes in reproductive cycle of female albino rats. Biosci Biotech Res Comm 2011; 4(1): 98-101.
16. Tietz NW., Pruden EL., and Siggaard-Andersen O. Electrolytes., blood gases and acid-base balance. In: N.W. Tietz., ed. Textbook of clinical chemistry. Philadelphia: Saunders 1986. 1188.
17. Andersoncook CM., Raj D. Making the concepts of power and sample size relevant and accessible to students in introductory statistics courses using applets. *J Stat Educ*. 2003; 3:.11.

18. Saravanakumar P., Thangapandiyan S., Dharanipriya R., Gowri Shankar S. Phytochemical Analysis and Antimicrobial Activity of Ocimum tenuiflorum (Tulsi)., A Known Indian Folk Medicinal Plant. *Int J Pharm Sci Rev Res* .2018; 53(2):. 24-28
19. Krishnanaih D., Sarbatly R., Bono A. Phytochemical antioxidants for health and medicine., *Nature Biotechnology of molecular Biology Reviews*. 2007; 1: 97-104.
20. Naik SL., Shyam PK., Marx P., Baskari., Devi VR. Antimicrobial Activity and Phytochemical Analysis of *O. tenuiflorum* Leaf Extract., *International Journal of Pharm Technology and Research*. 2015; 8: 88-95.
21. Price KR., Johnson TI., Fenwick GR. The chemistry and biological significance of Saponins in food and feeding stuffs., Critical Reviews in Food Science and Nutrition 26; 1987. 22- 48.
22. Sood S., Narang D., Thomos MK., Gupta YK., Maulik SK. Effect of *Ocimum sanctum* Linn. On cardiac changes in rats subjected to chronic restraint stress., Journal of Ethnopharmacology; 2006; 108: 423-7.
23. Merck. The Merck Veterinary Manual. 5th edition. Siegmund., O.H. (ed.)., Merck and Co. Inc. Rahway New Jersey USA. 1672pp 1979.
24. Anosa VO. Haematological and biochemical changes in human and animal trypanosomosis. *Revue d'Elevage et de Medecine Veterinaire des Pays Tropicaux*. 1988 ; 41(42);.151-164.
25. Adedapo AA., Abatan MO and Olorunsogo OO. Toxic effects of some plants in the genus Euphorbia on haematological and biochemical parameters of rats. *Veterinarski Arhiv*. 2004; 74: 53-62.
26. Li J and Kutar DJ. Interaction of thrombopoietin with the platelet complements receptor in plasma: binding., internalization., stability and pharmacokinetics. British Journal of Haematology. 1999; 106: 345 - 348.
27. Maphosa V., Masika PJ and Adedapo AA. Safety evaluation of the aqueous extract of Leonotis leonurus shoots in rats. *Human and Experimental Toxicology*. 2008; 7: 837 - 843.
28. Harper AH. Review of Physiological Chemistry. Lange Medical Publications., Las Altos., California. 1971. 529 p.
29. Duncan JR., Prasse KW and Mahaffey EA. Veterinary Laboratory Medicine., Iowa State University Press., Ames. 1994. Pp 102-107.
30. Adhikary P., Banerji J., Choudhuri D., Das A.K., Deb CC., Mukherjee SR and Chatterjee Asima. Antifertility effect of *Piper betle* Linn. Extract on ovary and testes of Albino rats. Ind J Exp Biol 27; 1989. 868-70.

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