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A Short Reviewon Pharmacological and Therapeutic Activity of Clitoria Ternatea

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ABSTRACT:
TheplantClitotiaternateaisregularlyusedforfoodcoloring,stress,infertilityandgonorrhea. The Clitoria ternatea plant showed many pharmacological effects includingantioxidant, hypolipidemic, anticancer, anti-inflammatory, analgesic, antipyretic, antidiabetic,CNS, antimicrobial, gastro-intestinal antiparasitic, insecticidal and many otherpharmacological effects. it is a twining herbal medicinal plant mostly found in Asia. Variousconstituents are found in different parts of the plant. This Review will chemical constituentsandpharmacological effects of Clitoriaternatea.
KEYWORDS: Clitoriaternatea, Antipyretic, Butterfly-pea,Fabaceae.

I. INTRODUCTION:

Alargeandincreasingnumberofpatientsintheworldusemedicinalplantsandherbsforhealthpurpose. Therefore, scientific study of their therapeutic potential, biological properties, andsafety will be useful in making wise decisions about their use.[1,2] There are hundreds ofsignificantdrugsandbiologicallyactivecompounds developedfromtheconventionalmedicinalplants.Plantshowedwiderangeofpharmacologicalactivitiesincludingantimicrobial,antioxidant,anticancer,hypolipidemic,cardiovascular,centralnervous,respiratory,immunological,anti-inflammatory,analgesicantipyreticandmanyotherpharmacological effects.[3]The introductory phytochemical showed that Clitoria ternateacontained tannins, phlobatannin, carbohydrates, saponins, triterpenoids, phenols, flavanoids,flavonol glycosides, proteins, alkaloids, antharaquinone, anthocyanins, cardiac glycosides,Stigmast-4-ene-3,6-dione, volatile oils and steroids. The plant showed many pharmacologicaleffectsincludingantioxidant,hypolipidemic,anticancer,antiinflammatory,analgesic,antipyretic, antidiabetic, CNS, antimicrobial, gastro-intestinal antiparasitic, insecticidal andmanyotherpharmacologicaleffects.ThisReview willhighlightthechemicalconstituentsandpharmacologicaleffectsof Clitoriaternatea.

PLANTPROFILE:
Aparajita'sbotanicalnameisClitoriaternateaandbelongstoFabaceae(Pipilionaceae)family.

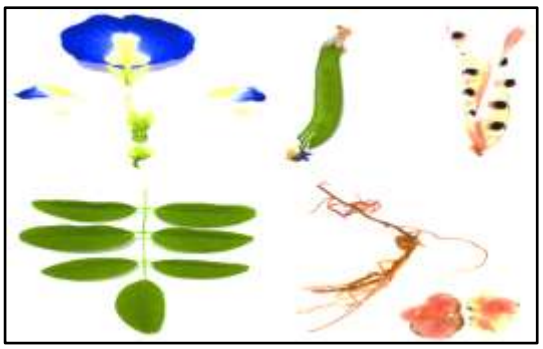

Fig.- Clitoriaternatea

Synonyms:
Clitoria bracteataPoir., Clitoria mearnsii De Wild., Clitoria albifloraMattei,ClitoriatanganicensisMicheli, ClitoriazanzibarensisVatke.[4]

Commonnames:
English : blue-pea, bluebellvine, butterfly-pea, cordofan-pea, Darwin-pea
Hindi:Aparajita
Marathi: Gokurna, ShankhaPushpa
Sanskrit: Girikarnika, Vishnukranta.[4,5]

Taxonomicclassification:
Kingdom : Plantae
Subkingdom :Viridaeplanta
Infrakingdom :Streptophyta
Division :Tracheophyta
Subdivision :Spermatophytina
Infrodivision :Angiospermae
Class :Magnoliopsida
uperorder:Rosanae

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Order :Fabales
Family :Fabaceae
Genus:ClitoriaL.
Species :Clitoria ternatea.[5,6]

BOTANICALDESCRIPTION:

Perennial climbing or trailing herb, growing from a woody rootstock.Leaves imparipinnatewith 2-4 pairs of leaflets and a terminal leaflet.Leaflets ovate to elliptic-oblong, up to 6.5 × 4cm,mostlyhairlessabove,pubescentbelow.Flowersa xillary,solitaryor2together,resupinate,largeandshow y,brightblue.Podlinearoblong,6-13cmlong,flattened,mucronateattheapex,hairless or finely pubescent.[7]

CHEMICALCONSTITUENTS:

Theintroductoryphytochemicalscreeningsh owedthattheplantcontainedtannins,phlobatannin,car bohydrates,saponins,triterpenoids,phenols,flavanoi ds,flavonolglycosides,proteins,alkaloids,antharaqui none,anthocyanins,cardiacglycosides,Stigmast-4-ene-3,6-dione, volatileoils and steroids.[8-10] The fatty acid content of Clitoria ternatea seeds comprise palmitic, stearic, oleic, linoleic, andlinolenic acids. Seeds also contained cinnamic acid, anthoxanthinglucoside, a highly basicsmallproteinnamedfinotin,watersolublemucila ge,delphinidin3,3',5'-triglucosideandbeta-sitosterol.[11-15] The aqueous extract of Clitoria ternatea flower (CTE) was explore to determinethetotalphenoliccompounds,flavonoid,an danthocyaninbyFolinCiocalteuassay,AlCl3colorime tricmethod, and pH differential method, respectively. The results signify that the contentoftotalphenolics,flavonoidsandtotalanthocya ninsinCTEwas53 ± 0.34mggallicacidequivalents/gd riedextract,11.2 ± 0.33mgcatechinequivalents/gdrie dextract,and1.46 ± 0.04mgcyanidin-3-glucosideequivalents/gdriedextract,respectively.[16] However,othersfoundthattheamount of total phenolics and flavonoids in Clitoria ternatea leaf extract were 358.99 ± 6.21mg/ggallic acid equivalent and 123.75± 2.84 mg/g catechinequivalent, respectively.[17] Theflowerscontainedflavonolglycosides.3-O-(2"-O-alpharhamnosyl-6"-O-malonyl)-beta-glucoside, 3-O- (6"-O-alpha-rhamnosyl-6"-O-malonyl)-betaglucoside and3-O-(2",6"-di-O-alpharhamnosyl)-beta-glucosideofkaemferol,quercetinandmyricetinwereis olatedfromthepetals. Delphinidin glycosides, 3-O-b-glucoside,3-O- (2"-O-a-rahmnosyl)-bglucoside, 3-O-(2"-O-a-rahmnosyl-6"-Omalonyl)-b-glucosideofdelphinidin,andeightanthocyanins(terna tinsC1,C2,C3,C4,C5andD3,andpreternatinsA3andC 4)werealsoisolatedfromtheflowers.[18-20]Threeflavonolglycosides,kaempferol3-O-(2"-O-alpha-rhamnosyl-6"-O-malonyl)-beta-glucoside,quercetin3-O-(2"-O-alpha-rhamnosyl-6"-O-malonyl)-beta-glucoside,andmyricetin 3-O-(2",6"-di-O-alpha-rhamnosyl)- beta-glucoside were isolated from the petals ofClitoriaternateacv.DoubleBlue,togetherwitheleve nknownflavonolglycosides.Theywerecharacterized asquercetin3-(2(G)-rhamnosylrutinoside)s,kaempferol,quercetin,myrice tin3-neohesperidosides,3-rutinosides,and3-glucosides.Inaddition,thepresenceofmyricetin3-O-(2"-O-alpha-rhamnosyl-6"-O-malonyl)-beta-glucoside was inferred from LC/MS/MS data forcrudepetal extracts.[21]

PHARMACOLOGICALANDTHERAPEUTIC EFFECTS:

Bluetea:

What is Blue Tea? Blue tea, or butterfly pea flower tea, is a caffeine-free herbal concoction, made by seeping dried or fresh leaves of the Clitoria ternatea plant. The best thing about the blue tea is that it is absolutely caffeine-free, and it is packed with antioxidants.

HealthBenefits ofBlueTea-

It seems that blue tea is just waiting to take the health world by storm. Here's the quick list ofbenefits

- WeightLoss
- AllNaturalParacetamol
- Beneficialfor EyeHealth
- CombatstheeffectsofDiabetes
- ZeroCaffeine
- GoodforHeartHealth
- PackedfullofAntioxidants
- AntiAgingProperties
- Combatsprematurehair loss/Male Patternbaldness
- EffectiveagainstStress, Anxiety,andDepression
- OverallBrainHealth
- Anti Inflammatory Properties.[22]

Anticancereffect:

Theinvitrocytotoxiceffectofpetroleumether andethanolicflowerextracts(10,50,100,200,500 µg/ml) of Clitoria ternatea was studied using trypan blue dye exclusion method. Bothextractsexhibitedimportantdosedependentcellc

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ytotoxicactivity.Forpetroleumetherextractthe concentration 10 µg/ml showed 8% reduction in cell count, however, 100% reduction wasobserved at 500µg/ml. In case of ethanolic extract, 10 µg/ml concentration possessed 1.33 %reductionin cellcount, while,at 500µg/ml 80% reductionincellcountwasobserved.[23]Theanticancera ctivityofClitoriaternateawasevaluatedinDalton'slym phoma(DLA)bearingmice.Tumourwasinducedinmi cebytheintraperitonealinjectionofDLAcells.After24 hoursoftumourinoculation,methanolextractofClitori aternatea(MECT)wasadministeredatdosesof100and 200mg/kgbodyweightfor14consecutivedays.Theeff ectofMECTwasassessedusing in vitro cytotoxicity, survival time, peritoneal cell count, hematologicalstudiesandantioxidantparameters.Tre atmentwithMECTdecreasedtumourvolume,packedc ellvolumeand viable count. It also increased the non-viable cell count and mean survival time, therebyincreasing the life span of EAC bearing mice. Hematological profile reverted to more or lessnormallevels in the treated group.[24]

Antioxidanteffects:

The separate solvent extracts of Clitoria ternatea leaf were assessed for their in vitro freeradical scavenging potential by 1,1-diphenyl-2-picryl-hydrazyl (DPPH) radical scavengingassay.Allextractsexhibitedpotentinvitrof reeradicalscavengingactivitythatincreasedwithextra ctconcentrations.Themethanolextractwasfoundtobet hemost influential,followedbythe chloroform and petroleum ether extracts.[25] Petrolem ether, chloroform and methanolextractsofroots ofblue and white flowered verities of Clitoriaternatea. Theantioxidantactivityandpreservativeabilityofclito riaternateaflowerpetalextract(CTE)wasinvestigated. CTEshowedantioxidantactivityasmeasuredbyoxyge nradicalabsorbancecapacity (ORAC) method and 2,2- diphenyl-1-picrylhydrazyl(DPPH) radical scavengingassay. CTE (400 µg/ml) remarkably protected erythrocytes against AAPH-induced hemolysisat 4 h of incubation. Moreover, CTE (400 µg/ml) reduced membrane lipid peroxidation andprotein carbonyl group formation and prevented the reduction of glutathione concentration inAAPH-induced oxidation of erythrocytes. The AAPH-induced morphological alteration oferythrocytes from a smooth discoid to an echinocytic form was effectively protected by CTE.[26]

Antidiabeticeffect:

The hypoglycemic effects of methanol, water, petroleum ether and chloroform extract ofClitoria ternatea leaves were evaluated in Streptozotocin induced diabetic rats for acute andsubacute effects. The extract of Clitoria ternatea (200 and 400 mg/kg) significantly reducedblood glucose level in Streptozotocin induced diabetic rats. 400mg/kg possessed significanthypoglycemic effect, 200 mg/kg also decreased glucose level but not as 400mg/kg. The resultofacuteeffectofthemethanolextract,showedthat 200and400mg/kg exerted averysimilareffect,butattheinitialstageatthe30min,2 00mg/kgshowedafinedecreaseinbloodglucoselevel. Subacuteactivityshowedthatonthelongtermuseofextr actthedose200mg/kgismuchbetter to control theblood glucoselevel than the 400 mg/kg dose.[27]

Centralnervouseffect:

Seeds and leaves of Clitoria ternatea have been widely used as brain tonic and believed topromotememoryandintelligence.TheactivityofClit oriaternateainAlzheimer'sdiseasewasstudiedtoinves tigateitsefficacyandtoidentifythemajorbioactivecons tituentattributingtheactivity. The result showed that the aqueous extract of Clitoria ternatea was beneficial inAlzheimer's disease through many mechanisms. The isolated compounds may act as a leadcompoundsforidentifyingnewderivativeswhichc ouldduseforimprovingmemory.Shankhpushpi, a well-known drug in Ayurveda, is extensively used for different centralnervoussystem(CNS)effectsespeciallymemor yenhancement.Differentplantswereusedunderthena meshankhpushpiindifferentregionsof India,leadingtoanuncertaintyregardingitstruesource. Plantscommonlyusedunderthenameshankhpushpiar e:ConvolvuluspluricaulisChois.,Evolvulusalsinoide sLinn.,bothfromConvolvulaceae,andClitoriaternate aLinn. (Leguminosae). The memory-enhancing activity of these three plants was investigated.PharmacologicalimportanceofClitoriat ernatea–
Areview75Anxiolytic,antidepressantandCNS-depressantactivitiesofthesethreeplantswerealsoeval uatedandcompared.Thenootropic activity of the aqueous methanol extract of each plant was tested using elevatedplusmaze(EPM)andstep-downmodels.Anxiolytic,antidepressantandCNS-depressantstudies were evaluated using EPM,Porsolts swim despair and actophotometer models.
Clitoriaternateaextract(CTE)showedmaximummem ory-enhancingandanxiolyticactivity($p<0.005$))at200and

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100mg/kg,respectively(p<0.05)antidepressantactivity.AllthethreeplantsshowedCNS-depressantactionathigherdoselevels.[28]

Gastrointestinaleffect:

The antiulcer potential of aqueous and ethanolic extracts of Clitoria ternatea was evaluated indifferent experimentally induced ulcer models in rats. Ethanolic extract (200 and 400 mg/kg)and aqueous extract (200 and 400 mg/kg) of whole plant were examined in pylorus ligationandindomethacininducedgastriculcerinrats. Variousparameterslikevolumeofgastricacidsecretion, pH, total acidity, ulcer index and antioxidant parameters were determined andcompared between extracts, standard and vehicle control group following ulcer induction.Among different dose of alcoholic extract, high dose showed significant antiulcer activity inpylorusligation and indomethacin induced ulceration.[29]

Hypolipidemiceffect:

The anti-hyperlipidemic effect of Clitoria ternatea L. was studied in experimentally inducedhyperlipidemia in rats. The poloxamer 407-induced acute hyperlipidemia and diet-inducedhyperlipidemiamodelswereusedinthisinvestigation.Oraladministrationofthehydroalcoholic extract of the roots and seeds of Clitoria ternatea resulted in a significant(p<0.05)reductionofserumtotalcholesterol,triglycerides,verylow-densitylipoproteincholesterol, and low-density lipoprotein cholesterol levels. The atherogenic index and theHDL/LDL ratio were also normalized after treatment in diet-induced hyperlipidemic rats. Theeffectswere compared with atorvastatin(50 mg/kg,po)and gemfibrozil (50 mg/kg, po).[30]

Antihistaminicandantiasthmaticeffect:

EthanolextractofClitoriaternatearoot(ECTR)wasevaluatedforantiasthmaticactivityusingmilkinducedleucocytosisandeosinophiliainmice,eggalbumininducedmastcelldegranulationsinratsandpassivecutaneousanaphylaxisinratsatdoses(100-150mg/kgip).followedbytheacetoneextractwhichshowedmaximumzoneofinhibitionagainstS.agalactiae (19 mm) andK. pneumonia(17 mm).[31-35]

Ant parasiticandinsecticidaleffects:

The ethanolic extract of Clitoria ternatea (100mg/ml) bring paralysis within 15-20 min andbring death within 28-30 min to the Indian earthworm Pheritimaposthuma.[36] However, theanthelmintic activity of ethanolic extracts of flowers, leaves, stems and roots of ClitoriaternateawerealsoevaluatedonadultIndianearthwormsPheretimaposthuma.ResultsshowedthatrootsoftheClitoriaternateatooklesstimetoparalyzeanddeathoftheearthworms.Rootswerefurtherextractedsuccessivelywithpetroleumether,chloroform,ethylacetate andmethanol and these extracts were screened for anthelmintic activity. Results showed thatmethanol extract of Clitoriaternatearoot is themorepotent.[37]

Anti-inflammatoryantipyreticandanalgesiceffects:

Ethanol extract of Clitoria ternatea root (ECTR) at doses 100, 125 and 150 mg/kg ip wereevaluatedforantihistaminicactivityusingclonidineandhaloperidolinducedcatalepsyinmice.Results showed that chlorpheniramine maleate (CPM) and ECTR inhibit clonidine inducedcatalepsy significantly (P<0.001) when compare to control group, while CPM and ECTR failtoinhibit haloperidol induced catalepsy.[38]

Immunomodulatory activity:

The immunomodulatory activity of Clitoria ternatea seed and root extracts was investigated, the effects on humoral immune response were investigated in SRBCs-sensitized rats, while, the effects on cell medicated immunity were studied by measuring delayed type hypersensitivity (DTH) response in SRBC-sensitized rats. Neutrophil recruiting and phagocytosis were measured by studying neutrophil adhesion and carbon clearance method respectively. Furthermore the effects on hematological parameters were also studied. Clitoria ternatea seed and root extracts showed significant immunosupressive effects as evident from significant decrease in Pharmacological importance of Clitoria ternatea – A review 77 primary and secondary antibody titers in SRBCs-sensitized rats, paw thickness in DTH response, and neutrophil adhesion and in vitro phagocytosis. The immunomodulatory effects of Clitoria ternatea on humoral, cell mediated and non-specific immune response could be attributed to decreased immune cell sensitization, immune cell presentation and phagocytosis. The authors concluded that the anti-inflammatory and antioxidant properties of plant might be playing major role in immunomodulatory activity.[39]

Diuretic and anti urolithiasis effect:

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Clitoria ternatea roots or their extract in 95% alcohol showed no significant diuretic or natriuretic effect in dogs when administered orally in non-toxic dose. Intravenous doses of the extract led to a moderate increase in the excretion of sodium and potassium in the urine, but at the same time, it showed signs of kidney damage. The inhibition of in vitro calcium oxalate crystal (a common major component of most urinary stones) formation by various extract of Clitoria ternatea was investigates by titrimetric method. The inhibitory potency of alcoholic extract of Clitoria ternatea was found to be comparable to that of Cystone (a proprietary drug for dissolving kidney stones). Alcoholic extract of leaves of Clitoria ternatea showed higher calcium oxalate crystallization inhibition (72.99±1.2%) in vitro in comparison with cystone (90.55±1.27%) in terms of formation of calcium oxalate precipitation.[40,41]

Wound healing effect:

The wound healing activity of Clitoria ternatea seed and root extracts was investigated using excision, incision and dead-space models in rats. Clitoria ternatea seed and root extracts significantly improved wound healing in excision, incision and dead-space models when administered orally by gavage as well as applied topically as ointment. These effects were comparable to that of cotrimoxazole ointment. The finding of the study also showed that Clitoria ternatea affected all three phases: inflammatory, proliferative and remodeling phases of wound healing.[42]

II. CONCLUSION:

ThepaperreviewedClitoriaternateaaspromi singmedicinalplantwithwiderangeofpharmacologica l activities which could be utilized in several medical applications because ofitseffectiveness and safety.

REFERENCE:

[1]. VickersA,ZollmanC.ABCofcomplementary medicineHerbalmedicine.BMJ1999;319:105 0-1053.
[2]. FikratIA.Cancerchemopreventiveandtumoric idalpropertiesofSaffron(CrocussativusL.).Ex perimental biology and medicine, 2002, 227: 20-25.
[3]. Al-SnafiAE.Chemicalconstituentsandpharmacol ogicalimportanceofAgropyronrepens– Areview. ResearchJournal ofPharmacology andToxicology 2015;1(2):37-41.
[4]. USDA,ARS,NationalGeneticResourcesProgr am.GermplasmResourcesInformationNetwor k-(GRIN),NationalGermplasmResourcesLabor atory,Beltsville,Maryland.URL:http://www.a rs-grin.gov.4/cgibin/npgs/html/taxon.pl?10942 (24 June2015)
[5]. ShahnasNandAkhilaS.Phytochemical,invitro andinsilicoevaluationonClitoriaternateaforal zheimer'sdisease.PharmaTuto 2014; 2(9):135-149.
[6]. ThePlantsDatabase,database(version4.0.4).N ationalPlantDataCenter,NRCS,USDA.Baton Rouge, LA70874-4490 USA.
[7]. Encyclopediaofthelife,Clitoriaternatea,http:// eol.org/pages/643360/overview
[8]. Kamilla L, Mnsor SM, Ramanathan S and Sasidharan S. Antimicrobial activity of Clitoriaternatea(L.)extracts. Pharmacologyonline 2009;1: 731-738.
[9]. Rai SS, Banik A, Singh A and Singh M. Evaluation of anti-ulcer activity of aqueous andethanolicextractofwholeplantofClitoriater nateainalbinoWistarrats.InternationalJournal ofPharmaceutical Sciences andDrug Research2015; 7(1): 33-39.
[10]. Mukherjee PK, Kumar V, Kumar NS and Heinrich M. The Ayurvedic medicine Clitoriaternatea-fromtraditionalusetoscientificassessment.Jou rnalofEthnopharmacology2008;120(3):291–301.
[11]. Kelemu S, Cardona C and Segura G. Antimicrobial and insecticidal protein isolated fromseeds of Clitoria ternatea, a tropical forage legume. Plant Biochemistry and Physiology 2004;42: 867-873
[12]. Husain S and Devi KS. Fatty acid composition of three plant species: Clitorea ternatea,ManduleasuberosaandRutachalapen sis.JournaloftheOilTechnologistsAssociation ofIndia1998; 30:162-164.
[13]. MacedoMLRandXavier-FilhoJ.Purificationandpartialcharacterization oftrypsininhibitorsfromseedsofClitoriaternat ea.JournaloftheScienceofFoodandAgricultur e1992;58: 55-58.
[14]. Sinha A. ß-Sitosterol from the seeds of Clitoria ternatea. Current Science 1960; 29: 180-181.
[15]. RippergerH.Isolationofstigmast-4-ene-3,6-dionefromHameliapatensandClitoriaternatea. Pharmazie1978;33(1):82-83.

International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 2 Mar-Apr 2021, pp: 190-196 www.ijprajournal.com ISSN: 2249-7781

[16]. Chayaratanasin P, Barbieri MA, Suanpairintr N and Adisakwattana S. Inhibitory effect ofClitoria ternateaflower petal extract on fructose-induced protein glycation and oxidation-dependentdamages to albumin invitro.BMCComplement AlternMed 2015;15:27.
[17]. JayakarBandSureshB.Hepatoprotectivepoten tialofClitoriaternatealeafextractagainstparace tamolinduced damagein mice. Molecules2011; 16: 10134-10145.
[18]. Kogawa K, Kazuma K, Kato N, Noda N and Suzuki M. Biosynthesis of malonylatedflavonoid glycosides on the basis of malonyltransferase activity in the petals of Clitoriaternatea.Journal of PlantPhysiology 2006;2(6):374-379.
[19]. Terahara N, Oda M, Matsui T, Osajima Y, Saito N, Toki K and Honda T. Five newanthocyanins,ternatinsA3, B4, B3,B2, and D2, fromClitoriaternateaflowers. JNatProd 1996; 59(2): 139-144
[20]. Terahara N, Toki K, Saito N, Honda T, Matsui T and Osajima Y. Eight new anthocyanins,ternatins C1-C5 and D3 and preternatins A3 and C4 from young Clitoria ternatea flowers. JNatProd. 1998; 61(11):1361-1367.
[21]. Kazuma K, Noda N and Suzuki M. Malonylatedflavonol glycosides from the petals ofClitoriaternatea. Phytochemistry 2003; 62(2):229-237.
[22]. https://teahow.com/blue-tea-benefits-side-effects-everything-you-need-to-know/
[23]. Shyamkumar B and IshwarBhat K. In-vitro cytotoxic activity studies of Clitoria ternateaLinn flower extracts. International Journal of Pharmaceutical Sciences Review and Research2011;6(2): 120-121.
[24]. Jacob L and Latha MS. Anticancer activity of Clitoria ternatea Linn. against Dalton'slymphoma
[25]. Mukhopadhyay R, Bhattacharya S and Biswas M. In vitro free radical scavenging activityof Clitoria.
[26]. Phrueksanan W, Yibchok-anun S and Adisakwattana S. Protection of Clitoria ternateaflower petal extract against free radical-induced hemolysis and oxidative damage in canineerythrocytes.ResVet Sci 2014;97(2):357-363.
[27]. AbhishekS,VikasS,MinuKandPankajM.Com parativehypoglycemiceffectsofdifferentextra ct of Clitoria ternatea leaves on rats. IOSR Journal of Pharmacy and Biological Sciences2015;10(2-III): 60-65.
[28]. Malik J, Karan M and Vasisht K. Nootropic, anxiolytic and CNS-depressant studies ondifferentplant sources ofshankhpushpi.Pharm Biol 2011;49(12):1234-1242.
[29]. Rai SS, Banik A, Singh A and Singh M. Evaluation of anti-ulcer activity of aqueous andethanolicextractofwholeplantofClitoriater nateainalbinoWistarrats.InternationalJournal ofPharmaceutical Sciences and Drug Research 2015; 7(1):33-39.
[30]. YBandJainSM.Antihyperlipidemicactivityof ClitoriaternateaandVignamungoinrats.Pharm aceuticalBiology 2010; 48(8): 915-923.
[31]. TaurDJandPatilRY.Evaluationofantiasthmati cactivityofClitoriaternateaL roots.JEthnopharmacol2011;136(2):374-376.
[32]. SolankiYBandJainSM.Immunomodulatorya ctivityofayurvedicplantAparajita(Clitoriatern ateaL.)inmalealbinorats. GlobalJournalof ScienceFrontierResearch 2010;10(3):2-8.
[33]. PialaJJ,MadissooHandRubinB.Diureticactivi tyofrootsofClitoriaternateaL.in dogs.Experientia1962; 18(2):89.
[34]. Solanki YB and Jain SM. Wound healing activity of Clitoria ternatea L, in experimentalanimalmodel.Pharmacologia20 12; 3(6): 160-168.
[35]. PonnusamyS,GnanarajW,MarimuthuJ,Selva kumarVandNelsonJ.Theeffectofleavesextract s of Clitoria ternatea Linn against the fish pathogens. Asian Pacific Journal of TropicalMedicine2010;3(9): 723-726.
[36]. ShekhawatNandVijayvergiaR.Anthelmintica ctivityofextractsofsomemedicinalplants.Inter national Journal of Computational ScienceandMathematics 2011;3(2):183-187.
[37]. Nirmal SA, Bhalke RD, Jadhav RS and Tambe VD. Anthelmintic activity of Clitoriaternatea.Pharmacologyonline2008; 1: 114-119.
[38]. Taur DJ and Patil RY. Antihistaminic activity of Clitoria ternatea L roots. J Basic ClinPharm2011; 2(1): 41-44.
[39]. Solanki YB and Jain SM. Immunomodulatory activity of ayurvedic plant Aparajita (Clitoria ternatea L.) in male albino rats. Global Journal of Science Frontier Research 2010; 10(3): 2-8.
[40]. Piala JJ, Madissoo H and Rubin B. Diuretic activity of roots of Clitoria ternatea L. in dogs. Experientia 1962; 18(2): 89.

[41]. Quazi S, Rathore P, Sharma A, Sharma P, Panchariya N and Sharma S. Inhibition of calcium oxalate crystallization in vitro by Clitoria ternatea root. Indian Journal of Drugs 2014; 2(1): 24-25.
[42]. Solanki YB and Jain SM. Wound healing activity of Clitoria ternatea L, in experimental animal model. Pharmacologia 2012; 3(6): 160-168.