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SCREENING OF 166 ANTIFERTILITY MEDICINAL PLANTS: REVIEW

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ABSTRACT

Medicinal plants are the valuable sources of herbal contraceptive well known to the Ancient Physicians of India. Modern contraceptives are restricted among women due to its unwanted side effects. The medical scientists are in search for suitable and active antifertility agents of synthetic and herbal origin to prevent conception. This review reveals with the number of herbal plants with their chemical constituents. Overall, 200 articles were reviewed and out of this 166 articles of proved effect of plants or isolated constituents in laboratory animals against antifertility were referred for citation. We found that all the reported extracts and individual compounds from these natural plants are beneficial in antifertility. This review indicates that it is time to increase the experimental studies to discover new chemical entities from vast unexploited plants having potential role in antifertility and also the exploration of mechanisms of action.

INTRODUCTION

Rapidly growing population is the most explosive problem being faced all around the world in developing countries like India and China where poverty is touching new heights. According to United nation projects that the population hit 6.5 billion by 2020 and 8.2 billion by 2050 in developed country. This steady rise in it causes detrimental impact on the international economy **[1]**. To combat this situation there is a need to look for a way of controlling the population growth. Fertility regulation has become the major concern of people of all walks of life **[2]**. Several remarkable steps have been taken by the Government of India and international bodies including NGOs in this direction to prevent conception viz. Popularizing family planning programmed public awareness and free distribution of contraceptives etc **[3, 4]**. India was the first country that launched "National Family Planning Program" in 1952 for the stabilization of population. The objective of this programme was "reduced birth rate to the extent essential to stabilize the population at a level consistent with the requirement of the national economy **[5]**. In olden times traditional methods are adopted that provided numerous ideas for reliable contraceptives of today's including the birth controlling pills, Copper bearing Intrauterine devices, Condoms, Diaphragm were intimately related to sexual intercourse therefore disliked by most couples and thus they have higher failure rates **[6]**. Nowadays hormonal contraceptives are widely used with 100% confidence and results in an unacceptable rate of unwanted pregnancies and other side effects **[7]**. The common side effects are breast cancer, cervical cancer, gastric trouble, obesity, venous thromboembolism etc. Keeping these things in mind there is a search for a suitable product from traditionally used indigenous medicinal plants and a number of plants had been screened in attempt to replace steroidal contraceptives and found to be safe and effective antifertility agents **[8, 9].**

Herbals as antifertility agents

Herbal medicines had become an integral part of life in many communities and considered as a promising avenue for the discovery of new drugs due to its easy access and relatively low cost. Medicines derived from herbal drugs are used as indigenous cure in folklore or traditional systems of medicine. As per estimation of World Health Organization that 80% of people worldwide rely on herbal medicines for some part of their primary health care **[10]**. India has often been referred to as the medicinal garden of the world. About 45,000 plant species have been claimed to possess medicinal properties. Ancient knowledge coupled with scientific principles can come to the forefront and provide us with powerful remedies to eradicate the

diseases **[11]**. A brief description of plants having antifertility activity with their active constituents is given in table 1. From the study of all antifertility medicinal plants, it was concluded that the potential of activity order of different parts is Leaf>Seed>whole plant>root>Aerial part=Bark>Stem>Fruit=Flower>Tuber>Stem bark>Rhizome. Leaves have maximum and rhizome have minimum potential for antifertility activity (figure 2).

Common antifertility animal models used for listed medicinal plants

Antifertility activity in herbals is evaluated with different animal models using various parameters like antagonism of uterus weight, antagonism of the effect of testosterone on weight of ventral prostate, seminal vesicles and musculus levator ani., anti androgenic activity in female rats, anti androgenic activity on sebaceous glands, test for anti- androgenic activity, test for anti-estrogen, test for an ovulatory agents, ovum count etc **[184, 185].**

CONCLUSION

In the present review, we have made an attempt to provide detail information and idea about the significance of herbal drugs towards antifertility activity and this may focus researcher's attention for clinical studies which would be of great scientific contribution to the society**.**

ACKNOWLEDGEMENT

No conflict of interest

Table: 1List of plants having antifertility activity with their active constituents

Botanical name	Family	Parts used	Active constituents	Uses	Reference
***Abrus precatorius* L.**	Leguminosae	Seed	PEP-103, PEP-104, Abridine	Used as oral contraceptive, prevents implantation of fertilized ovum by inhibiting endometrial alkaline phosphate. Sperm anti-motility activity.	[12,13,14]
Acacia arabica	Fabaceae	Stem bark	-	Effective oral contraceptive in rats and inhibits implantation	[15]
***Acacia caesia* (wight &Arn.)**	Mimosaceae	Bark	Acacia acid saponin, Lupeol, α-spinosterol	Spermicidal agent	[16]
Acacia catechu	Fabaceae	Exudate	-	Effective oral contraceptive in rats and inhibits implantation	[15]
Acacia concinna	Fabaceae	Bark	Lupeol, α-spinosterol, hexacosanol, α-apinasterone, acacia acid, acacia acid lactone and an amorphous saponin	Spermicidal and semen coagulating activities. Saponin showed spermicidal activity.	[16,17, 18]
Acalypha indica	Euphorbiaceae	Plant	-	Post-coital anti-fertility activity	[19]
Achrostichum aureum	Pteridaceae	Plant	-	Anti-implantation activity	[20]
Achyranthes aspera	Amaranthaceae	Aerial part, Leaf	-	Anti-implantation activity	[21,22, 23]
Adhatoda vasica	Acanthaceae	Leaf	Vasicine	Anti-implantation activity	[24, 25]
Adiantum capillus	Adiantaceae	Plant	Isoadiantone	Inhibited post coital implantation in rats	[26]
***Allium cepa* L.**	Liliaceae	Bulb	β-sitosterol, Kampferol	Abortifacient, Antifertility activity	[27]
***Albizzia lebbek* (L.) Benth.**	Leguminosae	Pod	Lebbekanin-E	Spermicidal activity	[28, 29]

Albizzia procera	Apocynaceae	Seed	Oleanolic acid saponin and Proceric acid saponin mixture	Spermicidal activity	[17]
Alstonia scholaris	Apocynaceae	Bark	Leupelol acetate	Antifertility effect in male rats.	[30, 31]
Anagallis arvensis	Primulaceae	Stem	-	Spermicidal and semen coagulating activities	[18]
***Ananas comosus* Mers.**	Bromeliaceae	Leaf	Stigmastane, Sitosterol β , Ergosterol peroxide	Antiimplantation activity	[32]
Ananas sativus	Bromeliaceae	Fruit	-	Antiovulatory activity	[33]
Andrographis paniculata	Acanthaceae	Leaf, Stem	Andrographilo-de	Anti-spermatogenic and anti-androgenic effect	[34, 35]
***Androsace septentrionalis* L.**	Primulaceae	Plant	Triterpene glycoside	Contraceptive and abortive action on rats and mice , prevented pregnancy in post-coital tests	[36, 37]
Annona squamosa	Annonaceae	Seed	-	Anti-implantation activity	[18]
***Aristolochia indica* L.**	Aristolochiaceae	Root	Aristolic acid, p-coumaric acid, Methyl aristolate	Anti-spermatogenic and anti-androgenic effects	[38]
Artabotrys odoratissmus	Annonaceae	Leaf	-	Anti-implantation activity	[39]
Asparagus pubescens	Liliaceae/ Asparagaceae	Root	-	It inhibited fetal implantation.	[40]
Austeroplenckia populnea		Leaf	-	Decrease sperm concentration in cauda epidydimides	[41]
Azadirachta indica	Meliaceae	Leaf, Seed	Neem oil	Anti-spermatogenic activities and histological changes in testes and epdidymides. Prevented pregnancy if taken before sexual intercource and	[42, 43, 44, 45, 46]

				checked embryo implantation.	
***Balanites roxburghii* L.**	Zygophyllaceae	Fruit peel	Apigenin & Luteolin	Mass atrophy of spermatogenic elements due to secondary effects	[47]
Bambusa vulgaris	Poaceae	Spadix	-	Anti-ovulatory effect	[33]
***Barleria prionitis* L.**	Acanthaceae	Root	-	Anti-fertility effect in male rats medicated by disturbances in testicular somatic cell functions.	[48]
Beaumontia grandiflora	Apocynaceae	Leaf	-	Showed anti-implantational, abortifacient and luteolytic effects	[49]
***Berberis chitria* Buch.-Ham ex. Lindl.**	Berberidiaceae	Root	Palmitine Hydroxide	Impairment of germ cells	[50]
Blepharispermum subsessile	Asteraceae	Rhizomes	-	Anti-implantation activity	[51]
***Brysocarpus coccineus* Schum**	Connaraceae	Leaf	-	Increases spontaneous utrine muscle contraction	[52]
Bursera fagaroides	Burseraceae	Cortex	Glycosides	Human spermatozoa and those obtained from mouse epididymis became agglutinated and immobilized	[53]
Butea frondosa	Papilionaceae	Seed	-	Partial abortive in action in mice and rats	[54]
Butea monosperma	Papilionaceae	Seed	Butin	Potential male contraceptive with minimal side effects	[55]
Caesalpinia decapetala	Fabaceae	Aerial Part	-	Contraceptive activity	[56]
***Calotropis gigantea* L.**	Asclipiadaceae	Root	Akundarin, Calotropin	Antiimplantation effect	[57]

***Calotropis procera* (Ait.) R.Br.**	Asclepiadaceae	Root	Calotropin	Antispermatogenic and anti-implantation effects	[58]
Carica papaya	Caricaceae	Fruit, Seed	Papain & Pectin	Contraceptive effects	[59, 60, 61, 62]
Casearia ilicifolia Hochst.	lacourtiaceae	Leaf	Flavonoids, Triterpenes & steroids	Anti-fertility activity	[63]
Casearia tomentosa	Flacourtiaceae	Leaf	-	Interferes with spermatogenesis, anti-implantational and abortifacient	[49]
***Cassia fistula* L.**	Fabaceae	Seed	Leucoanthocyanidin, Sennoside A &B, Rhein	Estrogenic activity	[64]
Celastrus paniculatus	Celastraceae	Seed	-	The testes of treated rats have shown vacoulisation, germ cell depletion arrest of spermatogenesis	[65]
Centella asiatica	Umbelliferae	Plant	Isothankuniside and BK Compound [Methyl-5-hydroxide-3,6-diketo-23(or 24)-norurs-12-en-28-oate]	Used as oral antifertility and both compounds caused consistent reduction of fertility	[66]
Chordia dichotoma	Boraginaceae	Leaf	-	Anti-implantational and abortifacient effects	[49]
Cichorium intybus	Asteraceae	Seed	-	Showed significant contraceptive activity	[67]
Citrullus colocynthis	Cucurbitaceae	Fruit	-	Anti-androgenic activity	[68]
Citrus hystrix	Rutaceae	Fruit peel	-	Estrogenic effect	[69]
Citrus limon	Rutaceae	Seed	-	Decreases the sperm motility and sperm count	[70]

Coccus lacca	Lacciferidae	Bark	-	Anti-implantation effect	[71]
Codonospis ovate	Campanulaceae	Plant	-	Anti-implantation activity	[24]
Colebrookia oppositifolia	Lamiaceae	Leaf	-	Effects on testicular cell population	[72]
Coleus barbatus	Labiatate	Leaf	-	Pregnant rats on treatment with extract before embryo implantation caused delayed fetal development	[73]
Combretodendron africanum	Lecythidaceae	Stem bark	Tannins & Saponisides	Caused abortion	[74]
Corchorus olitorious	Tiliaceae	Seed	-	Increases the carbonic anhydrase activity in the uterus of mice and elevates the level of progesterone	[75]
Crotolaria juncea	Fabaceae	Seed	-	Arrest spermatogenisis and is likely to have anti-androgenic activity	[76]
Croton roxburghii	Euphorbiaceae	Bark	-	Anti-steroidogenic activity	[77]
Curcuma longa	Zingiberaceae	Tuber	-	Spermatogenesis action	[78]
Cuscuta reflexa	Convolvulaceae	Stem	-	Increases the carbonic anhydrase activity in the uterus of mice and elevates the level of progestrone	[79]
Cynomorum coccineum	Cynomoriaceae	Stem, Root	-	Effect on epididymal sperm pattern	[80]
Daphne species	Thymellaeaceae	Plant	Yuahautin	Contraceptive and abortifacient effects	[81]
Dauous carota	Apiaceae	Seed	Volatile oil, carbohydrate fraction of Carrot seed oil	Estrogenic effect	[82]
Derris brevipes	Asteraceae	Root	-	Anti-implantation activity	[83]
Deutzia corymbosa	Hydrangeaceae	Plant	-	Antifertility activity	[84]

Dictamnus albus	Rutaceae	Root bark	Fraxinellone	Antifertility activity	[85]
Dieffenbachia amoena	Araceae	Leaf	-	Antifertility activity	[86]
Diospyros embryopteris	Ebenaceae	Leaf	-	Reduces sperm motility	[49]
Diploclisia glaucescens	Menispermaceae	Stem	Ecdysterone	Spermicidal activity	[87]
Dipsacus mitis	Dipsacaceae	Root	-	Antifertility activity	[88]
Dysoxylum binectariferum	Meliaceae	Stem bark	Rohitukene	Contraceptive agent	[89]
Echeveria gibbiflor	Crassulaceae	Leaf	-	Contraceptive agent	[90]
Echinops echinatus	Asteraceae	Root	-	Sperm anti-motility	[91]
Embelia ribes **Burm.f.**	Myrsinaceae	Seed, Root, Bark	Embelin	Potent oral contraceptive, antifertility activity	[92, 93]
Ensete superpa	Musaceae	Seed	Kadalin	Antifertility activity	[94]
Ephedera gerardiana	Ephedraceae	Plant	-	Antifertility activity	[84]
Epilobium angustifolium	onagraceae	Plant	-	Antifertility activity	[95]
Eugenia jambolana	Myrtaceae	Flower	Oleanolic acid	Spermatogenic activity	[96]
Ferula foetida	Umbellifera	Rhizomes	-	Anti-implantation activity	[97]
Ferula jaesochkeana	Umbellifera	Aerial part	Ferujol	Contraceptive agent	[98, 99]
Foeniculum vulgare	Apiaceae	Seed	Anethole	Anti-implantation activity	[100]

Gardenia jasminoides	Rubiaceae	Flower	Cycloartane triterpenoids namely gardenic acid and gardenolic acid B	Terminated early pregnancy in rats	[101]
Geranium lucidum	Geraniaceae	Plant	-	Antifertility activity	[84]
Gleditschia horrid	Fabaceae	Pod	Saponins	Anti-implantation activity	[102]
Globularia alypum	Globulariaceae	Leaf	-	Anti-implantation activity	[103]
Globularia Arabica	Globulariaceae	Leaf	-	Anti-implantation activity	[103]
***Gloriosa superb* L.**	Liliaceae	Root	Colchicine	Antiimplantation activity	[104]
Gnaphalium indicum	Compositae	Plant	-	Antifertility activity	[84]
Gossypium barbadense	Malvaceae	Seed	Gossypol	Antifertility activity	[105]
Gossypium herbaceum	Malvaceae	Seed	Gossypol acetic acid	Contraceptive effect	[106, 107]
Guaiacum officinale	Zygophyllaceae	Aerial part	Saponins	Abortifacient activity	[108]
Guetterda andamanica	Meliaceae	Aerial part	-	Contraceptive activity	[67]
Heliotropium indicum	Boraginaceae	Plant	n-hexacosanol, Sitosterol,Stigmasterol, Chalinasterol & Campestrol	Antifertility activity	[109]
Hibiscus macranthus	Malvaceae	Leaf	-	Effect on testicular function	[110]

Hibiscus rosa-sinesis	Malvaceae	Flower, Leaf	-	Anti-spermatogeni, antiandrgenic, Antifertility, anti-implantation activities	[111, 112, 113, 114]
Hyptis suabeoleus	Labiatae	Plant	-	Antifertility activity	[115]
Ixora finlaysoniana	Rubiaceae	Aerial part	-	Antifertility activity	[116]
Juniperus communis	Cupressaceae	Seed	-	Inhibit pregnancy	[24]
Kigelia pinnata	Bignoniaceae	Plant	-	Anti-implantation activity	[24]
Leonotis ocymifolia	Lamiaceae	Leaf, Root	Leonitin	Antifertility & Abortifacient effect	[117]
Lepidium capitatum	Cruciferae	Plant	-	Anti-implantation activity	[24, 118]
***Leucas cephalotes* (Roth.)**	Lamiaceae	Fruit	Oleanolic acid, 7-oxositosterols, stigmasterol, β- sitosterols	Antifertility activity	[119]
Lindenbergia indica	Scrophulariaceae	Plant		Arrests oogenesis	[120]
***Lygodium flexuosum* L.**	Schizaeaceae	Plant	-	Anti-ovulatory and anti-implantation activity	[121]
Malvaviscus conzattii	Malvaceae	Flower	-	Contraceptive effect	[122]
Marsdenia koi	Apocynaceae	Plant	Steroidal glycosides: Marsdekoiside A & B	Antifertility activity	[123]
Marsilea minuta	Marsileaceae	Plant	-	Elevates the level of cholesterol and ascorbic acid content of ovaries	[124]
Martynia annua	Martyniaceae	Root	-	Suppresses testicular and epididymal sperm counts and caused lesions on seminiferous tubules	[125]

Maytenus ilicifolia	Celasraceae	Leaf	-	Antifertility activity	[126]
Memcyclon lushingtonii	Meliaceae	Aerial part	-	Contraceptive activity	[67]
Mentha arvensis	Laminaceae	Leaf	-	Antifertility activity	[127]
Milletia auriculata	Fabaceae	Leaf	-	Reduces sperm motility	[49]
Momordica charantia	Cucurbitaceae	Seed	β –momorcharin & Sterols	Anti-spermatogenic effect	[128, 129]
Momordica cochinchinesis	Cucurbitaceae	Root, Tuber	Momorcochin	Abortifacient activity	[130]
Momordica dioica	Cucurbitaceae	Tuber	-	Spermicidal activity	[131]
Mondia whieti	Periplocaceae	Root	-	Inhibitory effects on spermatogenesis and reduces fertility	[132]
Montanoa tomentosa	Asteraceae	Leaf	Kaurenoic acid, Kauredionoic acid	Anti-fertility activity	[133]
Moringa oleifera	Moringaceae	Root	-	Anti-progestational and antifertility activity	[134]
Mucuna urens	Faboideae/ Leguminosae	Seed	-	Arrests spermatogenesis at spermatid stage	[135]
Murraya paniculata	Rutaceae	Root	Yuehchukene	Anti-implantation activity	[136, 137]
***Nelumbo nucifera* Gaerth.**	Nymphaeaceae	Seed	-	Anti-progestational and anti-estrogenic activities	[138]
Nicotiana tabaccum	Solanaceae	Aerial part	Nicotine	Anti-androgenic effect	[139]
***Nigella sativa* L.**	Ranunculaceae	Seed	-	Antifertility activity	[140]

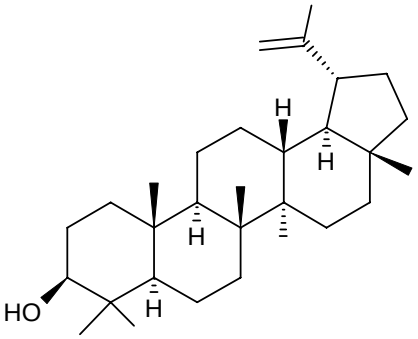
***Ocimum sanctum* L.**	Labiatae/ Laminaceae	Leaf	-	Antifertility activity	[141]
Pentapanax leschenaultti	Araliaceae	Fruit	Oleanolic acid, Triterpene glycosides	Spermicidal activity	[142]
Phonix *dactilifera*	Arecaceae	Fruit	-	Anti-ovulatory activity	[33]
Phyllanthus amarus	Phyllanthaceae	Plant	-	Anti-implantation activity	[143]
***Physalis minima* L.**	Solanaceae	Plant	-	Anti-implantation activity	[144]
Phytolacca americana	Phytolaccaceae	Root	Steroidal acidic saponin	Estrogenic effects	[145]
Phytolacca dodecandra	Phytolaccaceae	Bark	Saponins, Lemmatoxin, Oleanoglycotoxin-A, Lemmatoxin-C	Antifertility activity	[146]
***Piper longum* L.**	Piperaceae	Fruit	Piperine	Anti- spermetogenic effect	[93]
Pisum sativum	Fabacaeae	Seed	m-Xylohydroquinone	Oral contraceptives inhibits endometrial development in rats	[147, 148]
Pithecolobium saman	Fabacaeae	Flower	Samanin-D	Spermicidal activity	[149]
Plantanus orientalis	Platanaceae	Bark, Leaf	-	Anti-implantation activity	[84]
Plumbago zeylanica	Plumbaginaceae	Root	Plumbagin	Anti-implantation , abortifacient activity in rats	[150, 151]
Punica grantum	Punpacaceae	Plant without root	-	Anti-implantation activity	[84]
Quasia amara	Simaroubaceae	Bark	-	Anti- spermatogenic effect	[152]

Randia dumetorum	Rubiaceae	Seed	Oleanolic acid glycoside	Anti-implantation activity	[153]
***Ricinus communis* L.**	Euphorbiaceae	Seed	-	Showed anti-implantation activity	[154]
Rivea hypocraterformis	Convolvulaceae	Aerial part	-	Anti- implantation activity	[155]
Rubus ellipticus	Asteraceae	Plant without root	-	Anti- implantation activity	[24]
Ruellia prostrate	Acanthaceae	Plant	Lupeol, Sitosterol, Stigmasterol & long chain ester (C_{42}-C_{60})	Anti –fertility activity	[156]
Rumex steudelli	Polygonaceae	Root		Prolonged diestrous stage in rats. Produced anti-fertility effect.	[157, 158]
***Ruta gravelans* L.**	Rutaceae	Root, Stem, Leaf	Chalepensin	Showed significant anti-fertility activity in rats at early stages of pregnancy	[159]
Salsola tuberculatiformis	Chenopodiaceae	Plant	2-(4-acetoxyphenyl)-2-chloro-N-methyl-ethyl ammonium chloride (Compound A)	Contraceptive effect on female rats.	[160]
Salvia fruticosa	Lamiaceae	Leaf	-	Viable fetuses in females	[161]
Saraca indica	Fabaceae	Bark	-	Showed anti-progestational activity in rabbits. Exhibited anti- implantation effect	[71]
Sarcostemma acidum	Asclepidaceae	Stem	-	Arrests spermatogenisis in male rats without noticeable side effects	[162]
Schefflera capitata	Araliaceae	Plant	Schefferoside	Spermicidal activity	[163]

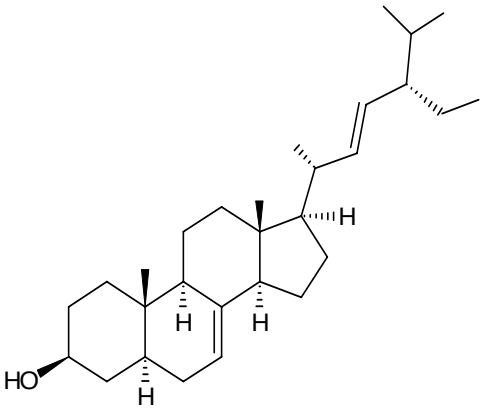
Senecio vulgaris	Asteraceae	Plant	Senicionine & Senicionine-N-oxide	Decreased the number of normal fetuses per pregnant rat	[164]
Sesbania sesban	Fabaceae	Seed	oleanolic acid 3-beta-d-glucuronide	Anti-implantation activity	[165]
Solanum crassypetalum	Solanaceae	Aerial part	-	Showed significant contraceptive activity in adult female rats	[67]
Sponias mombin	Anacardiaceae	Leaf	-	Induces abortion	[166]
Stephania hernandifolia	Menispermaceae	Leaf	Steroid	Spermicidal activity	[22]
Stevia rebaudiana	Astraceae	Plant	-	Decease in testosterone level	[167]
***Striga lutea* Lour.**	Scrophulariaceae	Plant	Acacetin, Luteolin & Flavones	Possesses significant anti-fertility activity in mice. Exhibits estrogenic property	[168]
Striga orobranchioides	Scrophulariaceae	Plant	Apigenin & Luteolin	Exhibited slight anti-estrogenic activity. Dose- dependent anti-implantation activity	[169]
Strumpfia maritime	Rubiaceae	Flowering top	-	Anti-fertility activity	[170]
***Taxus baccata* L.**	Taxaceae	Leaf	-	Inhibited pregnancy in 60% of albino rats	[171]
***Tephrosia purpurea* L.**	Fabaceae	Seed	Purpurin, Rutin	Anti-fertility activity	[172]
Tinospora cordifolia	Menispermaceae	Stem	-	Decreases sperm motility as well as sperm density, protein, glycogen contents of the testis	[173]
***Toddalia asiatica* (L.) Lam.**	Rutaceae	-	Berberine, Toddaline, Toddalinine	Abotifacient	[174]
Trichosanthes	Cucurbitaceae	Root,	β- Trichosanthin	Induced mid-term abortion in mice and	[175]

cucumeroides		Tuber		twice as potent as trichosanthin	
Trichosanthes kirilowi	Cucurbitaceae	Root, Tuber	Trichosanthin	Induced mid-term abortion	[175]
***Trigonella foenum-graceum* L.**	Papilionaceae/Fabaceae	Seed	Diosgenin, Yamogenin and Tigogenin	Exerts both anti-fertility and antiandrogenic activity.	[176, 177]
***Tripterygium wilfordii* Hook.**	Celastraceae	Root	Total glucosides, Diterpene epoxides, Triptolide, tripdiolide, Triptolideenol,	Safe, reversible male anti-fertility agent. Anti-apermatogenic activity similar to that of gossypol. induce complete infertility male rats	[178, 179]
***Vicoa indica* L.**	Asteraceae	Plant	Vicolid B, Vicolid D	Anti-implantation activity	[180]
***Vigna unguiculata* L.**	Fabaceae	Pod	-	Reduces spermatogenesis	[181]
Vinca rosea	Apocynaceae	Aerial part	Vincristine	Decrease in secretory activity of sex glands. Epididymal dysfunction.	[182]
***Vitex negundo* L.**	Verbenaceae	Seed	Flavonoid-rich fraction (5,7,3'-trihydroxy-6,8,4'-trimethoxy flavones)	anti-implantation effects	[183]
Ziziphus jujube	Rhamnaceae	Bark	-	Reversible anti-steroidogenic activity	[77]

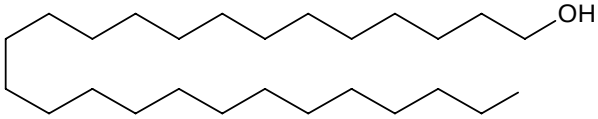
Figure: 1 Structure of some chemical constituents isolated from listed plants



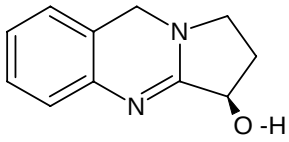
Lupeol



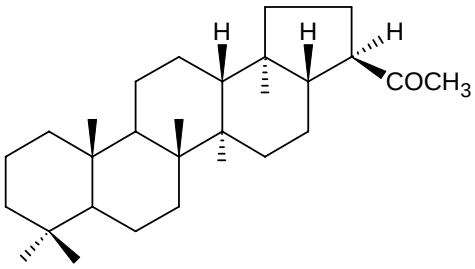
Alpha - spinasterol



Hexacosanal



Vasicine



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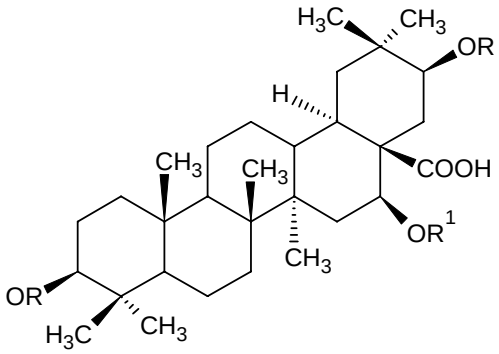
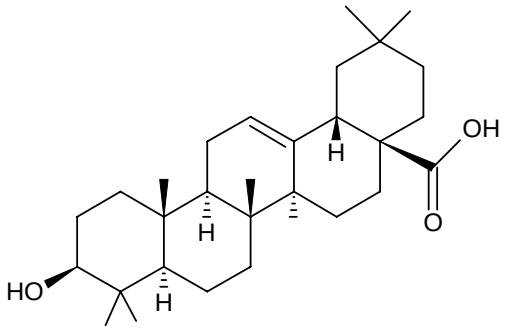
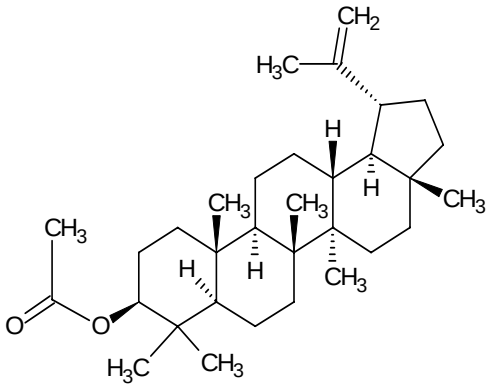


Lebbekanin -E



Oleanolic acid



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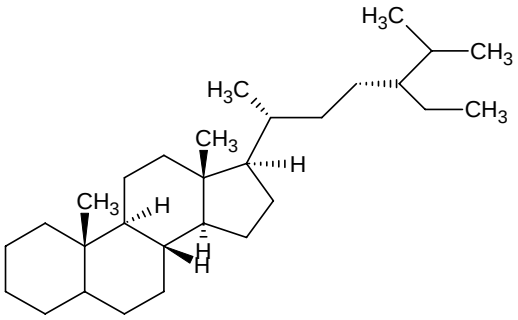

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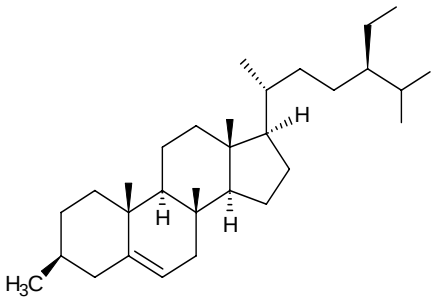
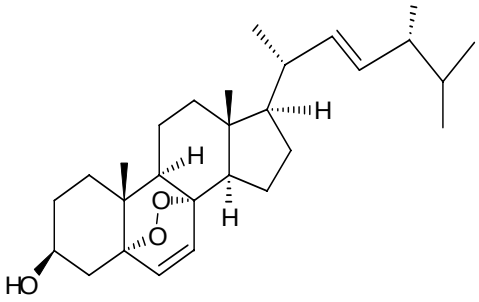
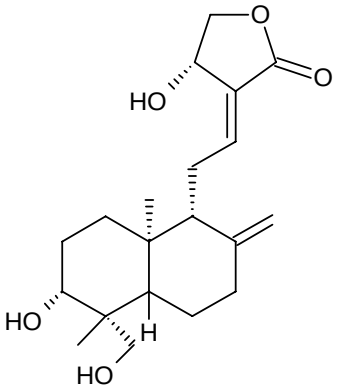


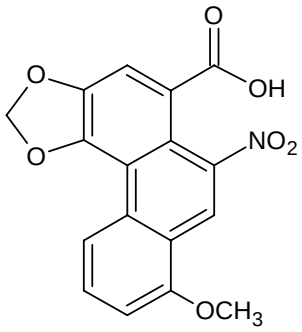
Beta - Sitosterol



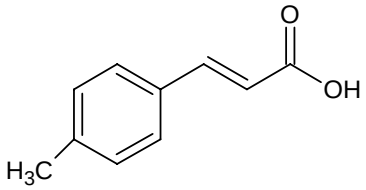
Ergosterol peroxide



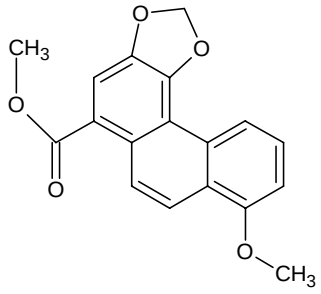
Andrographolide



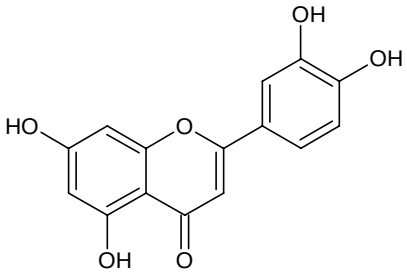
Aristolic acid



p -coumaric acid



Methyl aristolate



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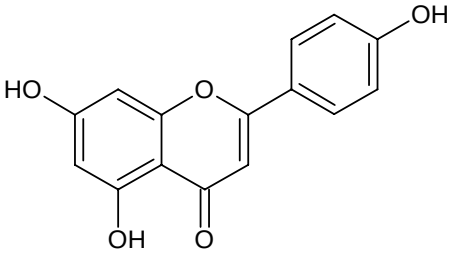

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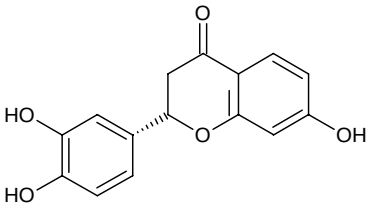
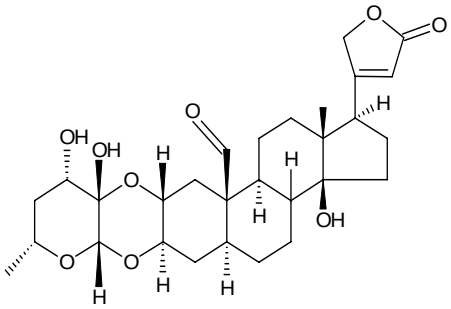
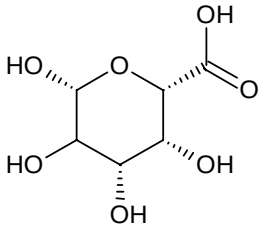


Butin



Calotropin



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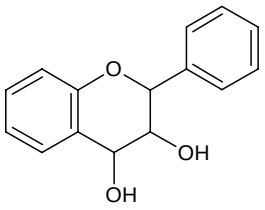

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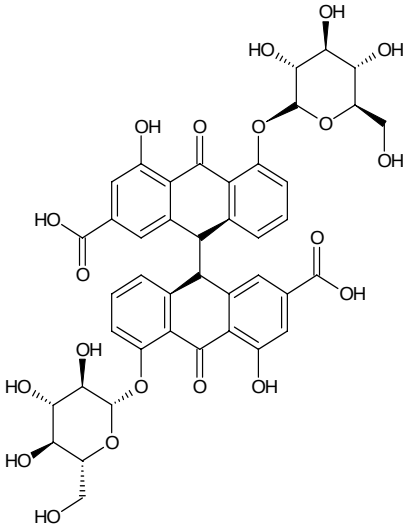
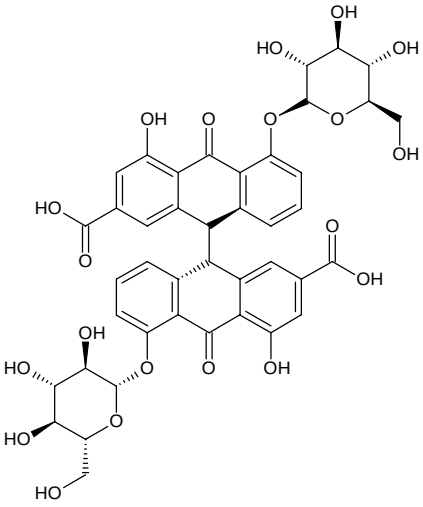
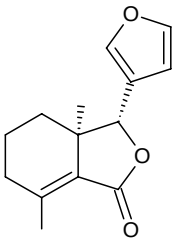


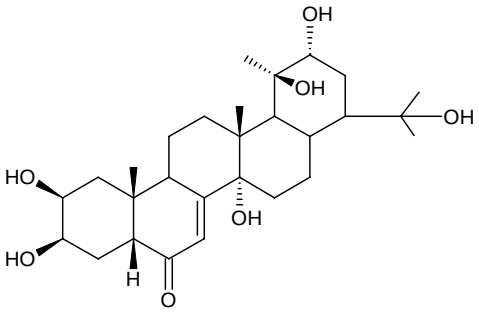
Sennoside A



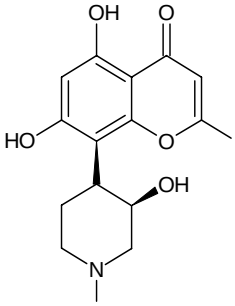
Sennoside B



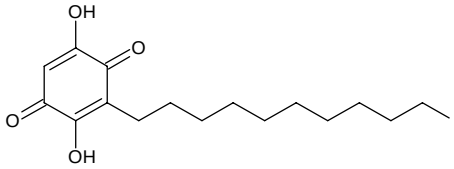
Fraxinellone



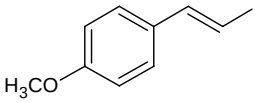
Ecdysterone



Rohitukene



Embelin



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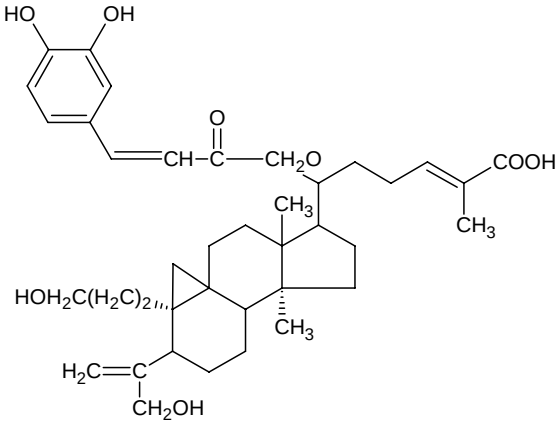
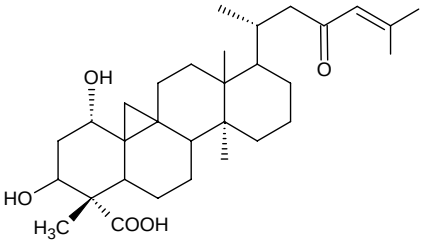
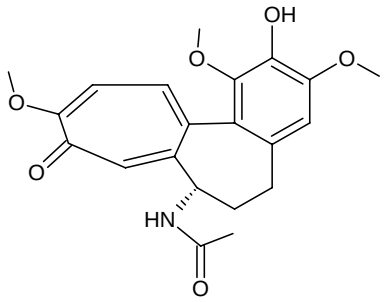


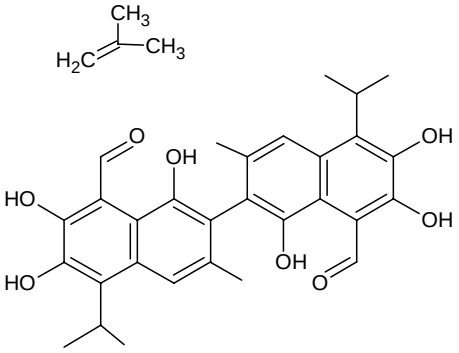
Gardenic acid



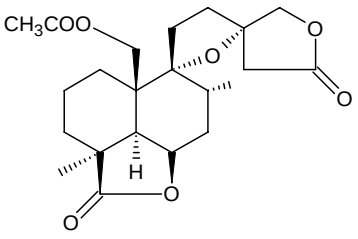
Gardenolic acid B



Colchicine



Gossypol acetic acid



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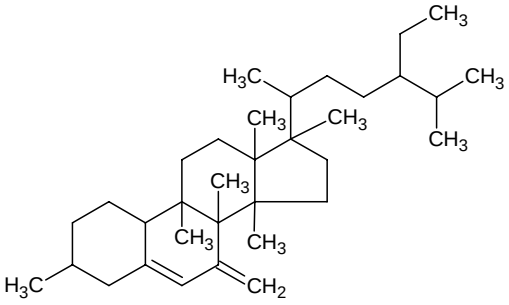
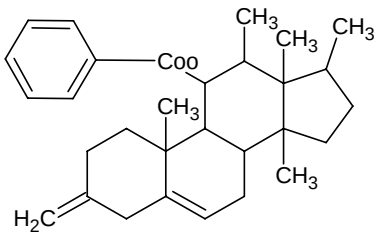
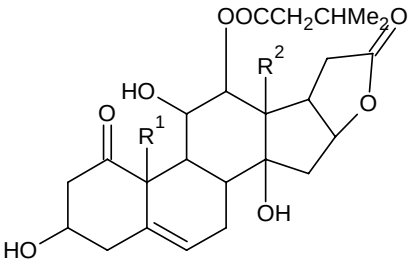


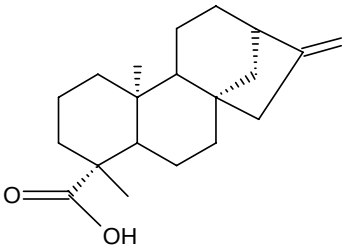
7 -Oxo -beta -sitosterol



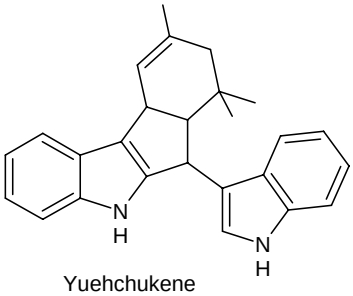
Tinctoramine



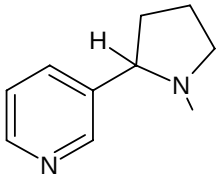
Tinctoralactone



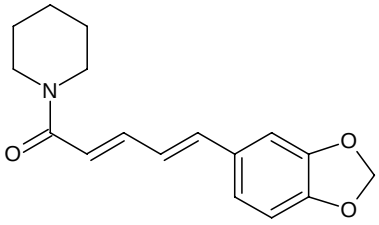
kaurenoic acid



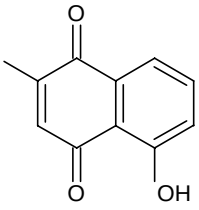
Yuehchukene



Nicotine



Piperine



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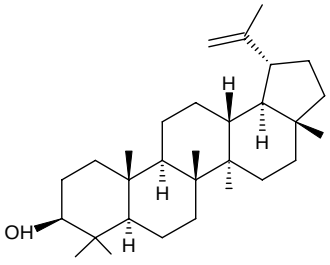
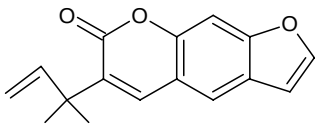
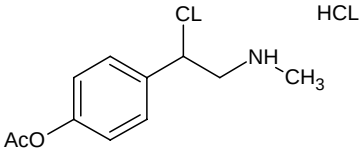


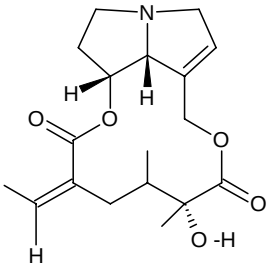
Lupeol



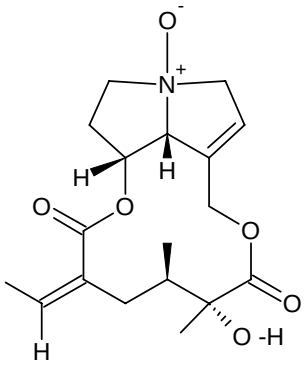
Chalepensin



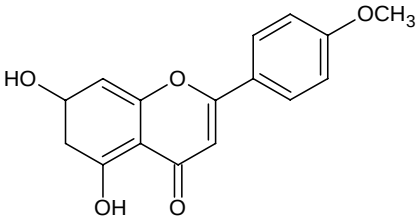
2 -(4 -acetoxyphenyl) -2 -chloro -N -methyl -ethyl ammonium chloride



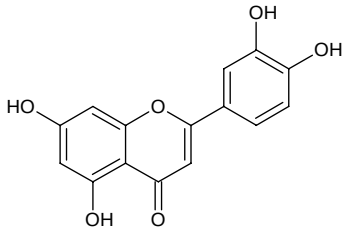
Senecionine



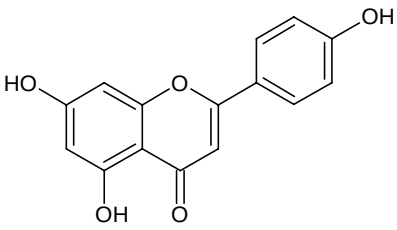
Senecionine N -oxide



Acacetin



Luteolin



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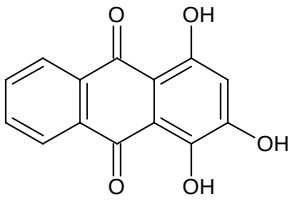
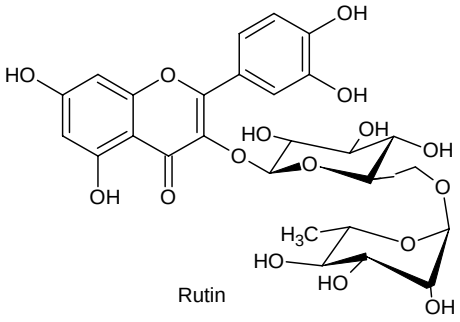
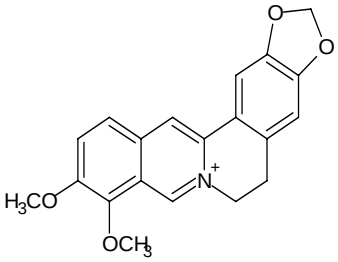


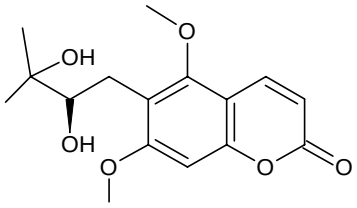
Purpurin



Rutin



Berberine



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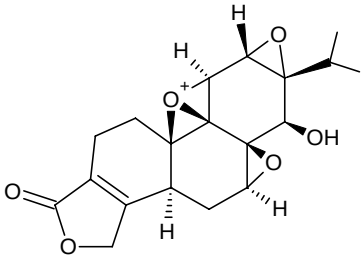
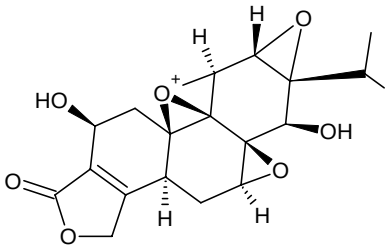
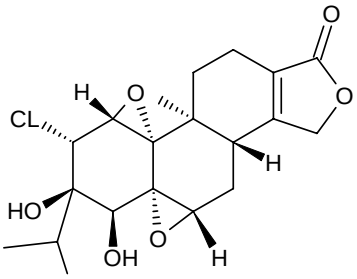


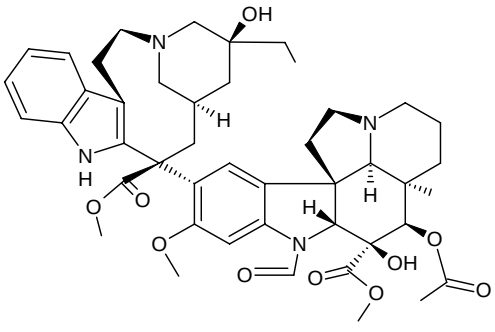
Triptolide



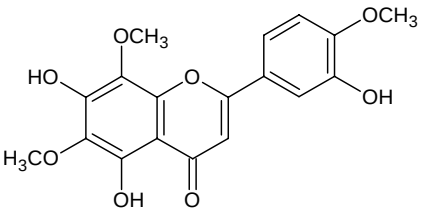
Tripdiolide



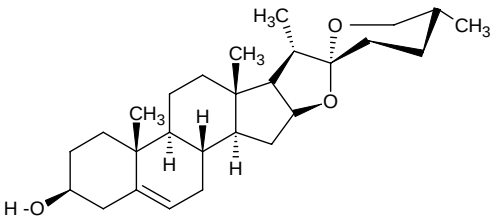
Tripchlorolide



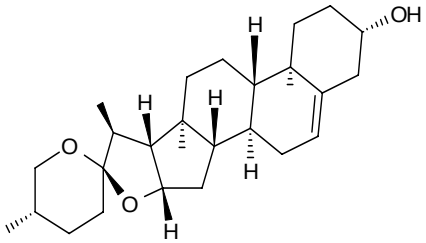
Vincristine



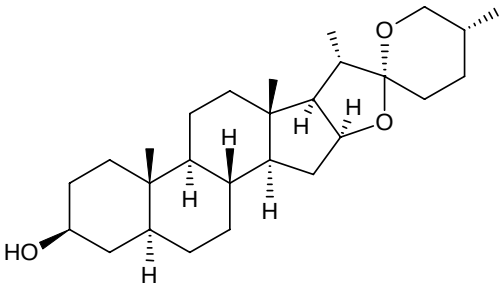
5,7,3' -trihydroxy -6,8,4' -trimethoxy (Acerosin)



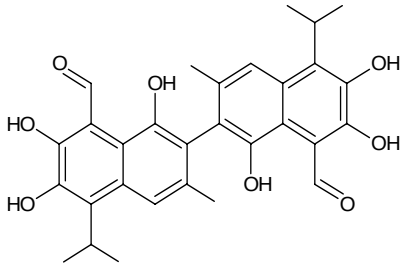
Diosgenin



Yamogenin

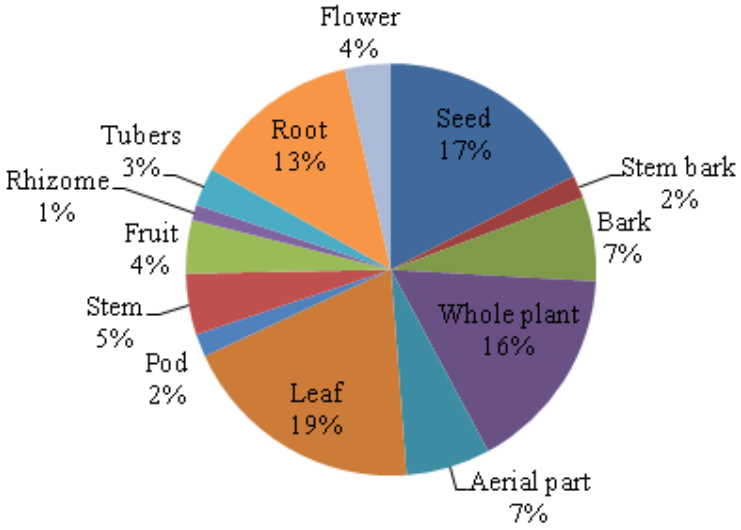


Tigogenin



Gossypol

Figure: 2 Percentage of Different plant parts responsible for antifertility activity



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