

Ethnoveterinary practices in animal reproduction: A review

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India has variety of medicinal plants and these plants used as a traditional knowledge to treat the animals. Post partum gynecological disorders like anoestrus, endometritis, metritis, pyometra, repeat breeding or even permanent infertility in female and reduced fertility or infertility due to impaired semen quality in male can be treated by using these plants medicines. Synthetic chemical drugs /medicines/ hormones are being frequently used to treat the reproductive disorders; its use may cause public health hazard and severe side effects on the animal reproduction. But the herbal drugs have fewer side effects and more benefits and have less health hazards. This paper describes the herbal medicines/ plants which are used in animal reproduction to cure reproductive disorders.

Keywords: Ethnoveterinary, Anoestrus, Retained placenta, Conception rate, Repeat breeding, Semen quality

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Fertility management is a vital component in the dairy animals which has profound effect in determining profitability of a farm. This is influenced by the higher age at first calving, delayed estrus, variability of estrous length, genital prolapsed, dystocia, retention of fetal membrane, seasonality of calving, long post partum anestrous and subsequent calving interval¹. Infertility poses serious economic losses to the farmers in terms of both low returns as a result of reduced milk production and increased veterinary expenses. Infertility occurs due to disruption of ovarian activity and estrus expression. The situation is exacerbated by negative energy balance during early lactation, delayed onset of estrus, delayed ovulation and fertilization failure. Culling rate in dairy animals is about 18-40 % per annum due to infertility or sterility in India². We are using the synthetic chemical (medicine, hormones) to treat the reproductive problem but it causes public health hazards and severe side effects on the fertility of the animals. But the herbal medicine lowers side effects, more benefits and less health hazards. Herbs can play an effective role in efficient reproductive management and successful rearing of our animals. WHO estimates, 80 % of the world population perceive on traditional system of medicines, where more than 7500 plants species (herbs, etc.) are being used³.

Reproductive problem in animals are mainly silent heat, delayed heat, anestrous, retained fetal membrane and uterine infection which occur after calving, because these period is crucial for the bovine life when various physiological, gynecological, biochemical changes occur and animals is exposed to high risk of infection to uterus because genitalia remains open for various days⁴ which leads to loss of milk production, late first heat, delayed conception rate, early embryonic mortality then finally animals become a repeat breeder even permanently infertility⁵. Irrational use of antibiotics for treatment of reproductive problem has lead to emergence of resistance strains⁶.

Based on the finding of above, now moving towards the use of the herbal preparation to overcome the reproductive problem. Plants used to treat the animals from thousands of years. Plant based drug may be used directly that they may be collected dried and their active ingredients separated by various chemical process which are employed as medicines. The active ingredients of plants may be glycosides, lipids, tannins and alkaloids⁷. World Health Organisation (WHO) has also recommended the promotion of Ethnoveterinary practices and conservation and cultivation of medicinal plants⁸. It is becoming increasingly evident that many herbal preparations are indeed of considerable medicinal

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value and needs for scientific validation. Since proving use of this herbal preparation, i.e. practices by the local and tribal community, but these preparations got very little attention in the present system for the treatment of various reproductive problems in farm animals.

Anoestrus

Anoestrus is one of the most commonly occurring reproductive problems in dairy animals in India, affecting livestock productivity and economics to a great extent. Anoestrus is absence of overt signs of estrus manifested either due to lack of expression of estrus or failure of its detection. It may be physiological or pathological. Plants have been used for the treatment of animals since long back it synthesizes varieties of phytochemicals such as alkaloids, glycosides, terpenes and tannins (secondary metabolites) as a part of their normal metabolic activity and many of these have therapeutic actions when consumed by animals. Many plants are rich source of vitamins and minerals whereas some have estrogenic property which is useful in restoration of cyclicity in anoestrous animals.

Supplementation of *Trigonella foenum-graecum* (Fenugreek) powder can solve anoestrous problem in cow⁹. Supplementation of 2-3 kg unripe *Carica papaya* (Papaya) fruits once a day for 4-5 days, animal comes into heat¹⁰. Supplementation of leaves of *Bambusoideae* (Bamboo), *Cucumis sativus* (Cucumber), *Aegle marmelos* Correa (Bale), *Leptadenia reticulata* (Retz.) Wight & Arn. (Meethi dodi), *Asparagus racemosus* Willd. (Shatavari) and *Couroupita guianensis* Aubl. (Cannon ball tree) for 6-7 days, treat anoestrus problem¹¹⁻¹³. Feeding of leaves of *Aegle marmelos* Correa (Bale) over 6-7 days, which is helpful to overcome anoestrus problem in animals¹³, similarly feeding of leaves of *Cucumis sativus* (Cucumber)¹² and *Bambuseae* (Bamboo) to cattle to bring it to the regular heat¹¹. Dilshad *et al.*¹⁴ boiled 500 gm leaves of *Ficus religiosa* (Peepal) in 2 L water; on remaining 250 ml this preparation feeding to the animals for 3 days and feeding of seeds of *Trigonella foenum-graecum* (Fenugreek) and *Cuminum cyminum* (Sufaid zeer) to the cow, help to overcome the problem of anoestrus^{9,14} similarly feeding of the three to four seeds or fruits of *Semecarpus anacardium* (Bhbilama) to animal for every day for 3-4 day when it is not coming into heat or fails to conceive successfully¹⁵.

Plants used for retained placenta

Retention of placenta is an important post partum complication for which number of risk factors have been identified, e.g abortion, stillbirth, twin births, dystocia, induction of parturition, metabolic disorders, and short gestation length¹⁶. Retained placenta may be due to lack of breakdown of the caruncle-cotyledon attachments¹⁶⁻¹⁸. Since, it has multiple etiologies, the therapy commonly advocated includes ecbolics, drugs or hormones which stimulate uterine contraction, minerals (Ca and P) and enzymes which may facilitate placental separation. The herbal remedies may be useful in uterine contraction.

It has been reported that gum of *Acacia nilotica* Delile (Babool), leaf paste of *Basella alba* (Climbing spinach/Creeping spinach/Buffalo spinach), whole plant of *Boerhavia diffusa* (Punarnava), *Oxalis corniculata* (Yellow Wood Sorrel, Indian Sorrel), seed oil of *Brassica napus* (Rape/oilseed rape/rapa), dried flower of *Corchorus capsularis* (Nalta jute), root of *Ficus benghalensis* (Bargad), leaf of *Mimosa pudica* (Sensitive plant, sleepy plant or shy plant) and whiskey of *Saccharum officinarum* (Sugar cane) are used to manage the retention of fetal membrane in animals¹⁹. Feeding a mixture of 1 kg crushed bark of *Dalbergia sissoo* (Indian rosewood, Sissoo) and 500 gm jaggery or about 50 gm seeds of *Brassica rapa* (Field mustard) boiled in camel milk is useful to overcome the problem of retention of fetal membrane cases in cows¹⁴. The root bark of *Caesalpinia bonduca* Roxb. syn. *Caesalpinia bonducella* Fleming (Fever nut) used to remove placenta after delivery²⁰. A mixture of approximately 2 kg *Pennisetum glaucum* R.Br. (Pearl millet) grain, 100 gm of *Trigonella foenum-graecum* (Fenugreek) seeds, 50 gm of *Lepidium sativum*, 25 gm of *Anethum graveolens* (Dill) and 500 gm of jiggery are boiled in water for one hour and then cooled. Feeding of this preparation to cow and buffalo causes expulsion of fetal membrane within 2-3 hrs²¹. Baraiya²² reported that 20-25 maize cob tassles boiled in water and fed to animals causes early dropping of placenta.

Improve the conception rate

About 80-100 gm *Aloe vera* leaf pulp is mixed with common salt and fed to pregnant cattle once or twice a day to prevent miscarriage²³. Feeding of roots of *Asparagus racemosus* (Shatavari) and *Phoenix acaulis* Roxb. (Dwarf Date Palm) to Sahiwal heifers,

lower age at puberty, age at first service and prevent the prolapse of uterus^{24,25}. *Hybanthus enneaspermus* F. Muell. (*Spade flower*), *Murraya koenigii* Spreng. (*Curry tree*) and *Echinops echinatus* Roxb. (*Indian globe thistle*) fed to cows to improved fertility²⁶. Feeding of whole plant of *Hydrilla verticillata* Royle (*Hydrilla*), flower of *Pandanus tectorius* Parkinson ex Du Roi (*Screw pine*), seeds of *Lens culinaris* Medik. (*Lentil*), *Myristica fragrans* Houtt. (*Nutmeg*), *Ricinus communis* (*Castor bean or castor-oil-plant*) and *Triticum aestivum* (*Genhu*) to increase the conception rate in animals¹⁹.

To prevent abortion, stem of *Musa paradisiacal* (*Banana*) fed to buffalo (10-15 kg) and cow (5-10 kg) for five times over a period of 2-3 days after conception. It helps to reduce internal heat and improves health²⁷. Feeding of 200 gm of germinated *Cicer arietinum* (*Bengal gram*) to the animal continuously for one week, improve the conception rate in heifers¹⁴.

Uterine infections

Comfrey extract (In propylene glycol base with allantoin, ascorbic acid and chlorophyll or carotene) has been used in the treatments of metritis in dairy cow using 90 ml of the comfrey extract infused into the uterus every day for 3 days²⁸. A 100 gm powder of root or bark of the *Convolvulus microphyllus* Sieber ex Spreng. (*Morning glory*) mixed with 300 ml of water and boiled for 10 min then this concoction is filtered and then cooled, fed the animals once a day for 3 days²⁹. Fruits of *Helicteres isoro* contain *Marodphali* ingredient, grind the fruits to make juice and 200-250 ml juice drench to the animals for treatment of the uterine infection³⁰.

Silent estrus /delayed puberty

Fifteen hundred gm *Gossypium hirsutum* (*Kapas*) mixed with jaggery, 150 gm *Linum usitatissimum* (*Alsi*) and 2 kg *Triticum aestivum* (*Genhu*) in seed form given to the animals for 5 days and feeding of 10 gm roots of *Ferula assa-foetida* (*Heing*) + 500 gm of petals of *Rosa indica* (*Gulab*) mixed with 1 kg of jiggery and 10 gm flowers of *Datura innoxia* Mill. (*Dhatura*) mixed in wheat flour to the animals for 2 days in case of silent heat or delayed puberty¹⁴. Feeding 10 gm roots of *Ferula assa-foetida* (*Heing*) + 500 gm of petals of *Rosa indica* (*Gulab*) mixed with 1 kg of jaggery and 10 gm flowers of *Datura innoxia*

(*Dhatura*) mixed in wheat flour to the animals for 2 days in case of silent heat or delayed puberty¹⁴

Genital prolapsed

Feeding of 250-300 gm of *cactus* (acial portion) mixed with 200 gm buttermilk and flour of *singhara* (*Water Chestnut*) to the animal's once daily can use for cervico-vaginal prolapse during pregnancy^{31,32}. Fruit juice of *Citrus medica* (*Galgal or Purak*) is mixed with powdered fruits of *Cuminum cyminum* (*Jeera*), paste of the whole plant of *Gomphrena serrata* and *Trichodesma indicum* Lehm. (*Indian borage*) is given for prolapse of uterus in cows and buffaloes²⁴.

Feeding of 250 gm bulb of *Allium sativum* (*Lahshun*) mixed with 250 gm of butter, 500 gm crushed flowers of *Brassica campestris* (*Sarso*) mixed in 500 gm yogurt shake, 1 kg of *Cucurbita maxima* Duchesne (*Kaddu*), 250 gm of crushed seeds of *Zea mays* (*Maize*) to the animals and sprinkle of grinded 500 gm seeds of *Trachyspermum ammi* Sprague (*Aajawain*) on the prolapsed area can be used for treatment of genital prolapse¹⁴.

One kg pulp juice of *Musa × paradisiaca* (*Banana*), 2 kg cursed seeds of *Hordeum vulgare* (*Jao*) and 1 kg *Ficus bengalensis* (*Bargad*) leaves boil in 1 L water (till it remains 250 ml) given to animals for 3 to 5 days orally treat the genital prolapse¹⁴.

Aloe vera, (*Indian Aloe*) and *Aristolochia bracteata* Retz. (*Kidamari*) both the plants significantly advanced the onset of puberty than the control animal, also observed that *Aloe vera* Burm.f. (*Indian aloe*) at a dose level of 300 and 500 mg /kg body weight had improved the follicular development and steroidogenic activity³³.

Root of *Abroma augusta* (*Devil's cotton*) and seed of *Nigella sativa* (*Kalonji*) are mixed in the ratio of 2: 1 show effect of anoestrus buffaloes and found effective in inducing estrus in 50 % animals with conception rate of 33.33 %.

Supplementation of leaf of *Murraya koenigii* Spreng. (*Curry tree*) and root of *Urtica dioica* (*Nettle or stinging nettle*) have significantly advanced the onset of puberty, increased the number of large surface and embedded follicles and also increased expression of ovarian glucose-6 dehydrogenase and 3 beta HSD enzymes function in goat and cattle³⁴.

Follicular dynamics

Aloe vera Burm.f. (*Indian aloe*) and *Aristolochia bracteata* Retz. (*Kilamari*) both the plants significantly advanced the onset of puberty in the animal, also observed that *Aloe vera* Burm.f. (*Indian aloe*) at a dose level of 300 and 500 mg per kg body weight had improved the follicular development and steroidogenic activity³³.

Abroma augusta (*Devil's cotton*) (root) and *Nigella sativa* (*Kalonji*) (seed) in the ratio of 2:1 in buffaloes, effective in inducing estrus in 50 % animals with conception rate of 33.33 %³⁴.

Supplementation of *Murraya koenigii* Spreng. (*Curry tree-leaf*) and *Urtica dioica* (*Nettle or stinging nettle-root*) significantly advanced the onset of puberty, increased the number of large surface and embedded follicles and also increased expression of ovarian glucose-6 dehydrogenase and 3 beta HSD enzymes function in goat and cattle³⁴.

Effect of Karrah on reproductive parameters

Chandra & Oberoi³⁶ reported that the effect of polyherbal mixture supplementation on post-partum reproductive performance in *Murrah* buffaloes. Polyherbal mixture was made by mixing 25 gm each of *Foeniculum vulgare* Mill. (*Saunf*), *Trachyspermum ammi* (*Ajwain*), *Trigonella foenum-graecum* (*Methi*), *Zingiber officinale* Roscoe (*Sundh*), *Anethum graveolens* (*Sowa*), *Elettaria cardamomum* Maton (*Cardamom*) and 25 gm black salt (*Kala Namak*). This mixture was boiled for about 20-30 min till half of water remained, then 250 gm of Jaggery (*Gur*) were added and heated for 5-10 min, prepared to be mixed with 1.5 kg of concentrate mixture and fed to the after parturition for 7 days in the morning hours. Polyherbal mixture used in the present study have facilitated the 24 lesser days for first insemination, 60 days shorter service period and 66.67 % lesser number of services per conception as compared to control groups.

Plants used for semen production

Herbs have been used for therapeutic purpose for many centuries. Sexual issues are no different. Civilizations from every continent have discovered numerous herbs that help to produce more semen. These herbs help to improvement in ejaculations, sperm counts, semen volume, and better overall sexual health.

Horny goat weed (aphrodisiac) can increase sperm volume and also is reputed to raise testosterone levels and stimulate the sensory nerves³⁷ and used to treat impotence, again pointed out that *Tribulus terrestris* (*Gokshura*) is a Chinese herb that stimulates sperm production improve sperm's survival time, motility and quality due to its steroidal saponin content in rats^{37, 38}. Jayaganthan *et al.*³⁹ reported that feeding *Tinospora sinensis* (*Giloy/gulanacha/gulbel*) in bucks enhanced the semen volume, sperm motility, percentage of viable spermatozoa, sperm concentration, morphologically abnormal spermatozoa, daily sperm production, sperm survival, sex libido and antioxidant profiles. Frydrychova *et al.*⁴⁰ reported that feeding of mixture of *Eurycoma longifolia* Jack (*Tongkat Ali or Pasak Bumi*), *Tribulus terrestris* (*Puncture vine*) and *Leuzea carthamoides* Willd. (*Moral root*) to boars enhanced their semen volume and sperm motility.

Feeding of *Tinospora sinensis* (Lour.) Merr. (*Giloy, gulanacha, gulbel*- antioxidant) in bucks enhanced the semen volume, sperm motility, percentage of viable spermatozoa, sperm concentration, daily sperm production, sperm survival and sex libido³⁹. Feeding of mixture of *Eurycoma longifolia* Jack (*Tongkat Ali or Pasak Bumi*), *Tribulus terrestris* (*Puncture vine*) and *Leuzea carthamoides* Willd. (*Moral root*) in boars enhanced the semen volume, sperm motility, percentage of viable spermatozoa, sperm concentration, daily sperm production, sperm survival and sex libido⁴⁰. Extract of *Ferula hermonis* adds in freezing extender of boar sperm during cryopreservation, increased sperm motility and viability and decreased lipoxidation⁴¹.

Seaweed extract (Trehalose) act as antioxidant, protect the sperm membrane structure against oxidative, cold shock damage during the freezing/thawing process and improve overall semen quality of rams⁴², bovine⁴³ and rabbit⁴⁴. Aqueous extract of *Rhodiola sacra* (Prain ex Raym.-Hamet) S.H. Fu (*Roseroot*-roots) used as an antioxidant, improved biochemical and sperm characteristics in cryo-preserved boar sperm^{45,46}. Supplementation of *Rosmarinus officinalis* (*Rosemary*) extract in freezing extender improved the boar sperm motility and fertility after cryopreservation⁴¹. Aqueous extract and rhizome powder of *Zingiber officinale* (*Ginger*) increase sperm counts, viability, mobility and serum total testosterone in male rat^{47, 48}. Pomegranate juice (1 ml/day) by adult male rats could have a beneficial

effect on epididymal sperm concentration (+49 %), sperm motility (+26 %) and the percentage of abnormal sperms⁴⁹ (-43 %). Daily supplementation *Amaranthus hypochondriacus* (*Cholai Bhaaji*) increase semen volume and sperm motility by 33 and 28 %, respectively in boars as this plant is not only a rich source of vitamins and minerals but is also characterised by a high squalene concentration⁵⁰. *Solanum lycopersicum* (*Tomatoes*) contained red pigment is called lycopene (C₄₀H₅₆), dietary supplementation of lycopene increased its concentration in the seminal plasma by 7-13 %, sperm concentration (+62 %) and motility (+66 %) in men^{51,52}.

Supplementation of *Sesbania sesban* (*Egyptian pea or jayanti*) @ 300 gm/kg had beneficial effects on the onset of puberty (-34 days), testicular growth (+13 %) and sperm count (+17 %) of male sheep. The leaves of *Sesbania sesban* (*Egyptian pea or Jayanti*) contain high levels of saponins and tannins⁵². Supplementation of whole plant (flavonoides and vitamins) powder of *Alexandrian laurel* (*Dana racemosa*) increases sperm mobility and viability in male rat⁵⁴. Seed of *Daucus carota* L. (*Jangli gazar*) contains volatile oils, steroids, tannins, flavonoids and carotene. It has got androgenic and antioxidant activities, elevates testosterone level in rat⁵⁵. Bark of *Lannea acida* A. Rich. (*Odina acida*) has got antifertility activity. It protects morphology of testes and decrease sperm abnormality in male rat⁵⁶. Flower of *Woodfordia fruticosa* are fed for three month to improve semen quality⁵⁷. Root of radish contain alkaloid (Coumarins, saponins, Flavonoids, anthocyanins), vitamin (A, C) and minerals (Ca, Fe), has free radical scavenging activity. It improves semen characteristic and nutritional performance in rabbit^{58,59}. *Mineral Pitch* (*Shilajit*) contain antioxidant, antiinflammatory, adaptogenic, immunomodulatory and antidyslipidemic properties, it increases serum testosterone level and sperm number in rat and man^{60,61}. *Curculigo orchoides* (*Black musli*) contain hepatoprotective, immune-stimulant, and antioxidant properties, it enhances sexual activity in male rats⁶². *Withania somnifera* Dunal (*Ashwagandha*) treatment induced testicular development and spermatogenesis in immature wistar rats by directly affecting the seminiferous tubules⁵⁶. *Lepidium meyenii* Walp. (*Maca root*) is a potent aphrodisiac and general health tonic containing Calcium, Magnesium, Manganese, Chromium, Selenium, EFA's, Vitamin A, B complex,

C, E and amino acids, supports normal sexual function that can improve libido, improve semen quality and increase ejaculate volume⁶³. *Tribulus terrestris* (*Gokharu fruit*) contain plant contain alkaloids, resins, tannins, sugars, sterols, essential oil, peroxidase, diastase and glucoside, improving sperm count, motility, and morphology, it also increase sex hormone production in man and may improve DHEA levels to treat erectile dysfunction⁶⁴. *Panax quinquefolius* (*American ginseng*) support healthy libido, erectile dysfunction and enhance male sexual performance, strengthens the HPA (hypothalamus-pituitary-adrenal) axis⁶⁵.

Traditional significance of the study

India is one of the world's 12 mega diversity countries accounting for 8 % global plant genetic resources. The successful rearing of dairy cattle and buffalo husbandry lies in ensuring proper and optimal reproductive rhythm of each individual female in the herd. Information about traditional knowledge on herbal medicines to treat the reproductive disorder in animals and human beings. Medicinal plants which plants have been claimed to be effective in modulating reproduction but the systemic scientific evidence regarding their mechanism of action, dosage or clinical efficacy is lacking (Dajin *et al.*, 1995). Therefore, to improve reproductive health of dairy animals, dairy farmers traditionally use, extracts of polyherbal mixture made from various herbs like *Foeniculum vulgare* Mill. (*Saunf*), *Trachyspermum ammi* (*Ajwain*), *Trigonella foenum-graecum* (*Methi*), *Zingiber officinale* Roscoe (*Sundh*), *Anethum graveolens* L. (*Sowa*) and *Elettaria cardamomum*, Maton (*Cardamom*), after mixing with jaggery and Black salt, etc. commonly called as "*Karrah*". Feeding of these polyherbal like, *Anethole* (Carminative, antimicrobial and anti-inflammatory activities), *Elettaria cardamomum*, Maton (analgesic, antiinflammatory, antimicrobial and antioxidant), *Foeniculum vulgare* Mill. (Carminative, antioxidant, antifungal, antibacterial, acaricidal activity), *Trachyspermum ammi* (carminative, laxative, stomachic and anthelmintic), *Trigonella foenum-graecum* L. (Immunomodulatory, antioxidant, antiinflammatory and antipyretic) and *Zingiber officinale* Roscoe (antioxidant, antiinflammatory and antipyretic) during transition period, may be reducing the peripartum stress by improving immune status and, beneficial effect on reproductive performance of the animals.

Conclusion

Reproductive management of dairy animals has a profound effect in determining efficiency and profitability of the dairy farm. Improved reproductive performance and reduced incidence of reproductive disorders have been observed by feeding various supplements like herbs, minerals, protected fats etc. Supplementation of poly-herbal mixture in transition diet enhances postpartum reproductive performance of the dairy animals. Researchers reported that the some herbal plants have been scientifically proved for their effectiveness on reproductive disorder management in farm animals but many medicinal plants have been reported to be effective in reproductive disorder. At present there is need to identify the bioactive substances and their chemical structures in plants extracts and effective dosage to provide health care for our livestock population.

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