



REVIEW ARTICLE

Traditional Medicine/Plants for the Treatment of Reproductive Disorders in Asia Nations

Muhammad Jahangir Hossen^{1,2}, Md Bashir Uddin^{3,4}, Syed Sayeem Uddin Ahmed⁵, Zhi-Ling Yu⁶ and Jae Youl Cho^{1,*}

¹Department of Genetic Engineering, Sungkyunkwan University, Suwon 440-746, Republic of Korea; ²Department of Animal Science, Patuakhali Science and Technology University, Dumki, Patuakhali -8602, Bangladesh; ³College of Veterinary Medicine, Chungnam National University, Daejeon 305-764, Republic of Korea; ⁴Department of Medicine, Sylhet Agricultural University, Sylhet-3100, Bangladesh; ⁵Department of Epidemiology and Public Health, Sylhet Agricultural University, Sylhet-3100, Bangladesh; ⁶School of Chinese Medicine, Hong Kong Baptist University, Kowloon Tong, Hong Kong, China

*Corresponding author: jaecho@skku.edu

ARTICLE HISTORY (15-438)

Received: October 10, 2015
Revised: January 08, 2016
Accepted: February 04, 2016
Published online: March 11, 2016

Key words:

Asian countries
Ethnomedicine
Medicinal plants
Reproductive disorder
Reproductive health

ABSTRACT

Traditionally, ethnomedicine plays a vital role for curing various diseases in Asian nation's specially rural and ethnic peoples for its lucrative and ease of use. For primary health care, 70-80% of the peoples in the developing countries rely on medicinal plant and the tendency of using ethnomedicine was also gradually increasing in the developed countries as it has almost no side effect. Traditional medicine plays an important role in the management of reproductive health problems of the Asian native population due to socioeconomic and geographical factors. Recently, attention of many pharmaceutical companies and researchers has been focused on medicinal plants, especially dietary products, as a wealthy resource for drug discovery and development because of the merit of diversified health benefits and therapeutic potentialities due to the presence of pharmacologically active compounds. Here, we benchmark the traditional herbal remedies for treatment of reproductive disorders to both human and animals with their identified molecular mechanisms and possibilities of further research as candidate for future drug discovery and development.

©2016 PVJ. All rights reserved

To Cite This Article: Hossen MJ, Uddin MB, Ahmed SSU, Yu ZL and Cho JY, 2016. Traditional medicine/plants for the treatment of reproductive disorders in Asia nations. Pak Vet J, 36(2): 127-133.

INTRODUCTION

Since ancient time, traditional medicine/plants play a vital role for curing various diseases in Asian nation's tribal and rural peoples of Bangladesh, China, India, Nepal, and Vietnam as well as South Korea and Japan (Hossen *et al.*, 2015a; Hossen *et al.*, 2015b) for its lucrative and ease of use (Lai *et al.*, 2012). In villages, ethnic people of many countries in Asia mainly depend on medicinal plants for their primary health care due to the socioeconomic and geographical background. In the developing countries, for primary health care, 70-80% of the peoples rely on medicinal plant and the tendency of using ethnomedicine was also gradually increasing in the developed countries as it displays almost no side effect (Luitel *et al.*, 2014; Hossen *et al.*, 2016). On the basis of the need, observation, and previous experience of the community people, ethnic people depend on the medicinal plants around them to acquire knowledge of economic values and medicinal properties of many plants and

traditional medicine (Malla *et al.*, 2015; Azhar *et al.*, 2015; Gull *et al.*, 2015). About 25% of modern medicines are developed from traditionally used medicinal plant sources; and research on ethnomedicinal herbal plants lead to discovery of 75% of herbal drugs (Wang *et al.*, 2003). Over 21,000 plant species were recorded by World Health Organization (WHO) for their medicinal uses throughout the world (Anonymous, 2002b).

Ayurvedic medicine (also known as Ayurveda) is Indian traditional medicine recognized as complementary and alternative medicine (Baliga, 2010). Despite the lacking of scientific verification of the effectiveness and the safety of medicinal plants, but due to cost-effectiveness and lacking of side effects, the use of ethnomedicine is becoming more popular as a complementary and alternative medicine (Nasir *et al.*, 2015; Hossen *et al.*, 2015c). In recent decades, the attention of pharmaceutical companies and researchers has been focused on medicinal plant as a wealthy resource for drug discovery and development because of

the merit of diversified health benefits and therapeutic potentialities due to the presence of pharmacologically active compounds. Each herb has its own unique combination and properties (Hossen, 2015; Hossen *et al.*, 2015d; Malla *et al.*, 2015). Besides the documenting of ethnomedicinal value of medicinal plant, molecular evidence based scientific validation of traditional medicinal plant has become important path of modern research. Though medicinal plants possess enormous ethnomedicinal value and reported to be used as traditional medicine to cure many diseases, but scant information about reproductive diseases is available.

In this review, therefore, we focus on the traditional medicine/ herbal plants used for the treatment of reproductive disorders in Asian countries with their identified molecular mechanisms and possibilities of further research as candidate for future drug discovery and development.

Advanced studies are needed to focus on effective doses of active medicinal plants/compounds for clinical trials and should be focused on explanation of bioavailability, permeability, and safe doses to offer natural active compounds from medicinal plants as most prospective novel candidates for future reproductive therapy.

Traditional medicine used for male reproductive disorders: For treating spermaturia the herbal preparation of *Centella asiatica*, *Hemidesmus indicus*, *Hibiscus eosa*

sinensis, *Dracaena terniflora*, *Phyllanthus fraternus*, and *Cuminum cyminum* are used. *Evolvulus alsinoides* and *Ocimum sanctum* are used to increase sperm count. Whole *Withania somnifera* is used to treat impotency (Table 1).

Traditional medicine used for female reproductive disorders: For the treatment of leucorrhoea, *Celastrus paniculatus* and *Hibiscus rosa-sinensis* were used. To treat menorrhagia, *Clerodendrum viscosum* and *prema latifolia* have been used. A range of herbs including *Ensete superbum*, *Mirabilis jalapa*, *Securinega leucopyrus*, *Celastrus paniculatus*, *Gardenia gummifera*, *Zizyphus oenoplea*, *Erythrina indica*, *Ixora coccinia*, and *Zizyphus rugosa* was identified to treat miscarriage. *Ocimum basilicum* and *Tabernaemontana divaricata* were applied to treat dysmenorrhoea. *Wrightia tinctoria* and *Diospyros montana* were claimed to be generally useful in treating various menstrual disorders and irregularities (Table 2).

The plants used in male and female reproductive disorders are arranged in alphabetical order of diseases with their botanical names. The parts used for preparation method of drug, and dose and duration of the treatment have also been provided. Information about the other ingredients, if any, is also given wherever available (Table 1 and 2). The family name, reported medicinal use, and pharmacology for the described plants are summarized in Table 3 and 4.

Table 1: Traditional medicine/ medicinal plants used for the treatment of male reproductive disorders

Ailments/ Male reproductive disorders	Plant name	Parts/s used	Preparation and dosage	Mode of action	References
Blood stain urine	<i>Calendula officinalis</i> (Asteraceae)	Flower	Infusion taken orally	Reduced malondialdehyde (MDA)	Sewani-Rusike and Mammen (2014); Verma <i>et al.</i> (2015)
*Spermaturia	<i>Centella asiatica</i> (L.) Urb	Whole plant	Equal quantities of ingredients are crushed in fresh milk. This mixture is given in the morning, once a day for a week	Neuroprotective activity	Chandrika and Kumarab (2015); Hegde <i>et al.</i> (2007)
	<i>Dracaena terniflora</i> Roxb.	Roots	2-3 spoons of decoction is given twice a day for a week		Hegde <i>et al.</i> , (2007)
	<i>Phyllanthus fraternus</i> Webster.	Whole plant	20 g of the plant crushed with a spoonful of jeerige. This mixture in milk is given twice a day for 8 days	Antioxidative, Antibacterial, antifungal	Hegde <i>et al.</i> (2007); Mehta (2014); Upadhyay <i>et al.</i> (2014)
Male impotency	<i>Withania somnifera</i> (L.)Dun	Root	Paste is prepared in rice washed water and one spoon a day is taken for 45 days	Reduced tumor cell proliferation.	Hegde <i>et al.</i> (2007); Kadir <i>et al.</i> (2012); Winters (2006)
	<i>Centella eriantha</i> (Apiaceae)	Root	Decoction taken orally or grind and mix with water than apply topically.		Sewani-Rusike and Mammen (2014)
Male circumstition to heal wound	<i>Helichrysum pedunculatum/nodifolium</i> (Asteraceae)	Leaves	Prepare paste and apply topically.	Antibacterial	Meyer and Dilika (1996); Sewani-Rusike and Mammen (2014)
To increase sperm count	<i>Evolvulus alsinoides</i> L.	Whole plants	Crushed plant is boiled in water till it reduces to half. This decoction is taken twice a day for a month	Anti-amnsic, antistress, antimicrobial	(Hegde <i>et al.</i> (2007); Singh (2008)
	<i>Ocimum sanctum</i> L.	Seeds	Crushed seeds are boiled in half cup of milk. This is given twice a day for 10 days	Antibacterial, antifungal Analgesic, antispasmodic and adaptogenic	Hegde <i>et al.</i> (2007); Pattanayak <i>et al.</i> (2010)
Testicular tumors	<i>Hypoxis hemerocallidea</i> (Hypoxidaceae)	Root corn	Paste and applied topically		Afolayan and Otunola (2014); Mogatle (2009); Sewani-Rusike and Mammen (2014)

*: *Hemidesmus indicus*(L.)schult. *Hibiscus rosasinensis* L. also used for treatment of Spermaturia

Table 2: Traditional medicine/ medicinal plants used for the treatment of female reproductive disorders

Ailments / Female reproductive disorders	Plant name	Parts/s used	Preparation and dosage	Mode of action	References
All types of menstrual disorders	<i>Saraca asoka</i> (Roxb.) De willd.	Bark	Decoction is given once a day for 8 days	Antimicrobial	Hegde <i>et al.</i> (2007); Rajith <i>et al.</i> (2012); Sainath <i>et al.</i> (2009)
Amenorrhoea	<i>Saraca asoka</i> (Roxb.) De willd.	Bark	Paste is taken one spoon/day for a week		
AIDS/HIV infections	<i>Hypoxis hemerocallidea</i> (Hypoxidaceae)	Root corn	Cooked and taken with food	Antiretrovirals	Peltzer <i>et al.</i> (2011); Sewani-Rusike and Mammen (2014)
	<i>Sutherlandia frutescens</i> (Fabaceae)	Leaves and flower petals	Infusion or decoction taken orally	Active against HIV target enzymes,	Harnett <i>et al.</i> (2005); Sewani-Rusike and Mammen (2014)
Blood stain urine	<i>Calendula officinalis</i> (Asteraceae)	Flower	Infusion taken orally	Antibiofilm, antibacterial and antioxidant	Ghaima <i>et al.</i> (2013); Sewani-Rusike and Mammen (2014)
Bleeding of pregnant women	<i>Anisotes ukambensis</i> (Acanthaceae)		Bark		Gakuya <i>et al.</i> (2013).
Dysmenorrhoea	<i>Ocimum basilicum</i> L.	Bark	Crushed in milk and given once in morning for 7 days		Hegde <i>et al.</i> (2007); Karousou and Deirmentzoglou (2011).
	<i>Tabernaemontana divaricata</i> (L.) R. Br.	Fresh Leaves	Crushed and mixed with buttermilk. This is taken once a day for 3 days		Hegde <i>et al.</i> (2007); Poornima <i>et al.</i> (2013)
Leucorrhoea	<i>Celastrus paniculatus</i> willd	Root /Bark	Root/bark is crushed in milk and given once a day for a week		Hegde <i>et al.</i> (2007); Singh, (2015)
	<i>Hibiscus rosa-sinensis</i> L.	Leaves	Crushed leaves is mixed with milk and filtered. Half a cup of filtrate is given in a day for 7 days		Hegde <i>et al.</i> (2007); Rao <i>et al.</i> (2010)
Low breast milk production	<i>Portulaca oleracea</i> (Portulacaceae)	Leaves	As an infusion taken orally		Haq <i>et al.</i> (2011); Sewani-Rusike and Mammen (2014).
Menorrhagia	<i>Clerodendrum viscosum</i> vent.	Leaves	Crushed leaves are mixed with milk. Half a cup of this milk is taken once a day for 8 days		Haque <i>et al.</i> (2000); Hegde <i>et al.</i> (2007)
Menstrual irregularities	<i>Wrightia tinctoria</i> R.Br.	Root	Equal quantity of pastes from both is mixed and given once a day for 10 days.		Bapuji and Ratnam (2009); Hegde <i>et al.</i> (2007).
	<i>Diospyros montana</i> Roxb.	Root			Hegde <i>et al.</i> (2007); Poornima <i>et al.</i> (2013).
Menstrual pain	<i>Zingiber officinale</i>	Root	In food or as infusion taken orally		Sewani-Rusike and Mammen (2014).
Menorrhagia and associated weakness	<i>Premna latifolia</i> Dalz.	Fresh leaves	Decoction is given once a day in the morning for 5 days	Antioxidant	Bharti <i>et al.</i> (2012); Hegde <i>et al.</i> (2007); Umarji and Deepa (2011)
Misconception and early abortion	<i>Ensete superbum</i> (Roxb.) cheeseman.	Seeds	Powdered seeds are given in milk once a day for 9 days		Hegde <i>et al.</i> (2007)
Miscarriage and misconception	<i>Mirabilis jalapa</i> L. <i>Securinega leucopyrus</i> (Willd.) Muell <i>Celastrus paniculatus</i> willd. <i>Gardenia gummifer</i> L.F. <i>Zizyphus oenoplea</i> mill. <i>Erythrina indica</i> L. <i>Ixora coccinea</i> L.	Roots	Crushed in milk and given once in morning for 5 days. Pastes of each is made separately and finally mixed in equal proportion. 2 spoons of this mixture is given in morning for 45 days		Hegde <i>et al.</i> (2007)
	<i>Zizyphus rugosa</i> lamk.	Bark Root			
Urinary infection	<i>Aqathosma apiculata</i> (Rutaceae)	Root	Chew or make an infusion and drink.		Sewani-Rusike and Mammen (2014)
Cervical cancer	<i>Aspalatus linearis</i> (Fabaceae)	Leaves and roots	Boils and drink as tea		Sewani-Rusike and Mammen (2014)

Table 3: Effects of medicinal plants on reproduction/other pharmacological activities

Scientific name (Family)	Medicinal Use	Identified pharmacological Activities
<i>Celastrus Paniculatus</i> Willd. (Celastraceae)	Used in anemia, as emmenagogue, aphrodisiac and abortifacient (Jain, 1991; Nadkarni, 1976)	Aphrodisiac, brain stimulant and memory enhancing activities (Jain, 1991; Nadkarni, 1976)
<i>Centella asiatica</i> (L.) Urb. (Apiaceae)	Used in anaemia and nervine disorders, as cooling agent, tonic and blood purifier (Jain, 1991)	Antifertility, sedative, antispasmodic and hypotensive (Sharma et al., 2000)
<i>Ensete superbum</i> (Roxb.) Cheeseman. (Musaceae)	Used in debility and weakness, as coolant (Nadkarni, 1976)	Antifertility and uterine stimulant activities (Dutta et al., 1970).
<i>Hibiscus rosa sinensis</i> L. (Malvaceae)	Used in menorrhagia, seminal weakness, uterine and vaginal discharges and menstrual complaints (Nadkarni, 1976)	Anti-fertility, anti-estrogenic anti-ovulatory activity in rats (alcoholic and benzene extracts) (Gupta, 2003; Yelne et al., 2002)
<i>Ocimum bacilicum</i> L. (Lamiaceae)	Used in gonorrhoea, as aphrodisiac and emmenagogue (Nadkarni, 1976)	Antimicrobial, <i>in vitro</i> anti-HIV and antioxidant properties (Gupta, 2003)
<i>Ocimum sanctum</i> L. (Lamiaceae)	Used in debility and weakness, genito-urinary ailments, as aphrodisiac, blood purifier and cooling agent (Nadkarni, 1976)	Antispasmodic, aphrodisiac, antimicrobial, immunostimulatory activities (Anonymous, 2002a).
<i>Phyllanthus fraternus</i> Webster. (Euphorbiaceae)	Used in allergy, gonorrhoea, and genitor-urinary disorders (Jain, 1991)	Antibacterial, antispasmodic, and uterine relaxant activities (Rastogi, 1998)
<i>Saraca asoka</i> (Roxb.) De willd. (Caesalpinaceae)	Used in uterine infections, menorrhagia and other menstrual complaints, as tonic (Jain, 1991; Nadkarni, 1976)	Oxytocic, uterotonic, antioestrogenic properties and used against menorrhagia (Gupta, 2003; Sharma et al., 2001).
<i>Withania somnifera</i> (L.) Don. (Solanaceae)	Used in general and seminal debility, spermatorrhoea, as aphrodisiac and diuretic (Nadkarni, 1976)	Hypotensive, relaxant, aphrodisiac, antispasmodic activities (Gupta, 2003)

Table 4: Plants with known medicinal uses in reproductive diseases

Botanical name (Family)	Local name	Reported medicinal uses	References
<i>Clerodendrum viscosum</i> vent. (Verbenaceae)	Taggi	Used in syphilis and as a tonic.	Jain (1991);
<i>Cuminum cyminum</i> L. (Apiaceae)	Jeerige	Used in gonorrhoea, as a tonic, emmenagogue and coolant	Nadkarni (1976)
<i>Diospyros Montana</i> Roxb. (Ebenaceae)	Balagane	Used in menorrhagia and as an abortifacient	
<i>Erythrina indica</i> L. (Fabaceae)	Bili Haalivaana	Used in menorrhagia and as an aphrodisiac and emmenagogue	
<i>Evolvulus alsinoides</i> L. (Convolvulaceae)	Vishnukraanthi	Used in debility, syphilis, leucorrhoea, spermatorrhoea and as an aphrodisiac	
<i>Gardebia gummifera</i> L.f. (Rubiaceae)	Bikke	Used in dyspepsia and as an antiseptic and tonic	
<i>Hemidesmus indicus</i> (L.) Schult. (Asclepiadaceae)	Haala balli	Used in leucorrhoea, impotency, menstrual complaints, spermatorrhoea, as a tonic, aphrodisiac and cooling agent	
<i>Ixora coccinea</i> L. (Rubiaceae)	Hole daasaala	Used in gonorrhoea, leucorrhoea, and dysmenorrhoea	
<i>Mirabitis jalapa</i> L. (Nyctaginaceae)	Madhyaahna mallige	Used in debility, as a tonic and aphrodisiac	
<i>Premna latifolia</i> Dalz. (Verbennaceae)	Naravala	Used in gonorrhoea and as a diuretic	
<i>Securinega leucopyrus</i> (Willd) Muell. (Euphorbiaceae)	Bilihooli	Antimicrobial agent	Sharma et al. (2001)
<i>Tabernaemontana divaricata</i> L. (R.Br.)	Najabattala	Used in strangury and as a tonic	Jain (1991);
<i>Wrightia tinctoria</i> R.Br. (Apocynaceae)	Kodasa	Used in seminal weakness, as a tonic and aphrodisiac	Nadkarni, (1976)
<i>Zizyphus oenoplea</i> Mill. (Rhamnaceae)	Parige	Used as a blood purifier.	
<i>Zizyphus rugosa lamk.</i> (Rhamnaceae)	Mullannu	Used in menorrhagia and to treat syphilis.	

Table 5: Effect of medicinal plant/traditional medicine in different reproduction diseases model and their potential uses

Types of disorders/molecular signalling pathway	Plants/traditional medicine	Anti-reproductive disorders effect	References
Paroxetine-induced sexually impaired male rats.	Oral administration of <i>Allium cepa</i> bulb ethyl acetate fraction (200 mg/kg for 7 days)	Restored the normal sexual behavior	Malviya et al. (2013)
Testicular torsion-detorsion ischemia-reperfusion injury of the testis.	<i>Psoralea corylifolia</i> was administered orally	Decreased malondialdehyde level and significantly increased CREMt expression and spermatogenesis	Wei et al. (2011)
Oxitocin-induced uterine contraction in mice	Xiang-fu-si-wu decoction.	Blocking Ca ⁺² channel	Liu et al. (2011)
Spermatogenesis cycle in rat	Juice of <i>Allium cepa</i> bulbs (0.5 and 1g/rat/day)	Increase LH level, Increase sperm number, viability and motility	Khaki et al. (2009)
Germline signalling pathway (<i>Caenorhabditis elegans</i>)	<i>Morus alba</i> L Polyphenols	Inhibit Transcription factor: DAF-12, DAF-16, PHA-4, and NHR-80 Target gene: fat-6, lip1-4, sod-3, unc-51, and fard-1	Zheng et al. (2014)
Pregnant Swiss mice	<i>Byrsonima verbascifolia</i> hydromethanolic extract	Mutagenicity or immunostimulation	Gonçalves et al. (2013)
Male infertility (maneb-induced toxicity in male reproductive function)	<i>Basella alba</i> and <i>Carpolobia alba</i> Extract	Stimulated testosterone and improve fertility	Manfo et al. (2014)

Table 6: Identified ethnoveterinary uses of medicinal plants for treatment of reproductive diseases

Family	Species	Indication	Plant part used	Chemical constituents
Araliaceae	<i>Cussonia spicata</i>	Bark used for retained placenta in stock, leaves used treat endometritis and/or vaginitis in cows	Leaves, bark	Antibacterial, anti-inflammatory, mutagenic (Luseba et al., 2007; McGaw et al., 2007)
Asparagaceae		Retained placenta in cows (Dold and Cocks, 2001); sores, red water, uterine infections (Van der Merwe et al., 2001)	Roots, tubers	
Asphodelaceae	<i>Aloe thimarloi</i>	Retained placenta, dystocia	Leaves	Antibacterial antibacterial, anti-inflammatory, mutagenic
Asphodelaceae		Retained placenta, in cows	Leaves	
Aspidiaceae	<i>Dtyopteris athamantica</i>	Retained placenta in cows (McGaw and Eloff, 2008)	Rhizome decoctions	
Combretaceae		Fertility problems (Luseba and Van der Merwe, 2006)	Root bark	
Diocoreaceae	<i>Dioscorea sylvatica</i>	Swollen udders and uterine problems in cows (McGaw and Eloff, 2008)	Lotions from boiled crushed inner parts of tubers	Diosgenin (McGaw and Eloff, 2008)
Ebenaceae	<i>Diospyros mespiliformis</i>	For milk production (Luseba and Van der Merwe, 2006)	Bark	
Euphorbiaceae	<i>Croton gratissimus</i>	Fertility enhancement (Van der Merwe et al., 2001)	Leaves, roots	
Fabaceae	<i>Acacia decurrens</i> willd.	Hastens oestrus (Masika et al., 2000)	Bark decoction Bark leaves	
Gunneraceae	<i>Gunnera perpensa</i> L.	Used to facilitate expulsion of afterbirth in animals and women (McGaw and Eloff, 2008)	Roots	
Htacinthaceae	<i>Urginea sanguinea</i> schinz			
Hypoxidaceae	<i>Hypoxis hemerocallidea</i>	Retained placenta (Van der Merwe et al., 2001)	Corms	
	<i>Hypoxis rigidula</i>	Fertility enhancement, general ailments, heart water, abortion (Van der Merwe et al., 2001)		
Malvaceae	<i>Hibiscus malacospermus</i>	Retained placenta, (Masika et al., 2000)	Root decoction	
Moraceae	<i>Ficus sur</i>	Root decoctions for retained placenta in cows	Leaves, bark roots	Bark may contain tannin (Hutchings, 1996)
Oleaceae	<i>Olea europaea</i> L.	Leaves used for endometritis and vaginitis in cows. (Dold and Cocks, 2001)	Leaves bark	
Pedaliaceae	<i>Dicerocaryum eriocarpum</i> <i>Dicerocaryum senecioides</i>	Dystocia, drench for retained placenta	Aerial parts, roots whole plants	
		(Luseba and Van der Merwe, 2006; Van der Merwe et al., 2001)		
Pedaliaceae	<i>Harpagophytum procumbens</i>	Retained placenta (Van der Merwe et al., 2001)	Fruit	
Rhamnaceae	<i>Ziziphus ucronata</i> Willd.	Fertility enhancement	Roots, leaves	
Rubiaceae	<i>Pentanisia prunelloides</i>	Retained animal or	Root decoctions	
Salicaceae		Retained placenta (Hutchings, 1996; Masika et al., 2000)	Decoction or infusion of unspecified parts root	
Sapindaceae	<i>Azima tetraacantha</i> Lam.	Dystocia in cows (Dold and Cocks, 2001)		
Sapotaceae	<i>Englerophytum magalismontanum</i>	Fertility enhancement (Van der Merwe et al., 2001)	Roots	
Solanaceae	<i>Solanum mauritianum</i>	Dystocia in cows (Dold and Cocks, 2001)	Roots	
Solanaceae	<i>Withania somnifera</i> (L.)	Used to stimulate milk production in cows	Unspecified parts, roots	Many compounds including choline, tropanol, glycowithanolides, withanolides, withaferine and withasomnine (Hutchings, 1996)
Tiliaceae	<i>Grewia flava</i>	Fertility enhancement (Van der Merwe et al., 2001)	Roots	
Tiliaceae	<i>Triumfetta sonderi</i> L.	Retained placenta (Van der Merwe et al., 2001)	Root bark	
Typhaceae	<i>Typha capensis</i>	Decoctions taken or applied externally to aid expulsion of afterbirth in animals and humans	Unspecified parts	Quercetin 3-dimethyl4-glucoside from leaf (Hutchings, 1996)
Urticaceae	<i>Pouzolzia mixta</i> solms	Retained placenta, bloat, vaginal discharge (Van der Merwe et al., 2001)	Roots leaves, stems	
Zygophyllaceae	<i>Tribulus terrestris</i> L.	Retained placenta.	Whole plant, aerial parts	

Molecular mechanisms of identified medicinal plants treated for reproductive diseases and prospective ethnoveterinary uses: Molecular mechanisms of identified medicinal plants for treating reproductive

diseases or treatment in clinical trials are highlighted in Table 5. In case of paroxetine-induced sexually impaired male rats, oral administration of *Allium cepa* bulb ethyl acetate fraction (200 mg/kg) for 7 days restored the

normal sexual behaviour (Malviya *et al.*, 2013), while *Psoralea corylifolia*, *Allium cepa*, *Basella alba*, and *Carpolobia alba* increased the spermatogenesis and male fertility (Khaki *et al.*, 2009; Manfo *et al.*, 2014; Wei *et al.*, 2011). *Byrsonima verbascifolia* hydromethanolic extract inhibited mutagenicity (Gonçalves *et al.*, 2013), whereas Xiang-fu-si-wu decoction inhibited oxytocin-induced uterine contraction in mice by blocking Ca²⁺ channel (Liu *et al.*, 2011). Mulberry (*Morus alba* L.) leaf polyphenols inhibited the transcription of nuclear hormone receptors such as DAF-12, DAF-16, PHA-4, and NHR-80 of germ line signalling pathway in *Caenorhabditis elegans* (Zheng *et al.*, 2014). Identified ethnoveterinary uses of medicinal plants for treatment of reproductive diseases are listed in Table 6.

Conclusions: This review highlighted on the traditional herbal medicine uses for the treatment of reproductive disorders of human health in Asian countries as well as benchmarked the reported ethnoveterinary uses of medicinal plants for reproductive health of animals. The present documentation of medicinal uses of traditional herbals may serve to both record herbal practices to develop our knowledge and to understand the mechanisms of actions and their use in treating a range of reproductive disorders. This paper instigates to be a wide range of opportunities for ethnopharmacologists and wide range of scientists to explore indigenous herbs and to elicit phytochemical, pharmacological, and clinical uses. In advance studies, documenting herbal usage and expanding upon current knowledge will enhance the understanding view to experts in this field and hopefully give us a milestone for the development of safe, cost effective, and traditional treatments for a range of reproductive disorders.

Acknowledgements: Authors are very grateful to Prof. Dr. Ahrar Khan, University of Agriculture, Faisalabad, Pakistan for his proposal and continual encouragement for writing the manuscript.

REFERENCES

- Afolayan AJ and Otunola GA, 2014. Ultrastructure and elemental analysis of *Hypoxis hemerocallidea*: A multipurpose medicinal plant. *Afr J Tradit Complement Altern Med*, 11: 39-43.
- Anonymous, 2002a. WHO Monographs on Selected Medicinal Plants. World Health Organization.
- Anonymous, 2002b. WHO Traditional Medicine Strategy 2002-2005. World Health Organization.
- Aslam S, Jahan N, Rahman KU and Khan KM, 2015. Efficacy of herbal mixture for the treatment of salbutamol induced myocardial necrosis in rabbits. *Pak Vet J*, 35: 355-359.
- Azhar MF, Aziz A, Haider MS, Nawaz MF and Zulfiqar MA, 2015. Exploring the ethnobotany of *Haloxylon recurvum* (Khar) and *Haloxylon salicornicum* (Lana) in Cholistan desert, Pakistan. *Pak J Agric Sci*, 52: 1085-1090.
- Baliga MS, 2010. Triphala, Ayurvedic formulation for treating and preventing cancer: a review. *J Altern Complement Med*, 16: 1301-1308.
- Bapuji JL and Ratnam SV, 2009. Traditional uses of some medicinal plants by tribals of Gangaraju Madugula Mandal of Visakhapatnam district, Andhra Pradesh. *Ethnobot Leaflets*, 2009: 2.
- Bharti R, Ahuja G, Sujana GPS and Dakappa SS, 2012. A review on medicinal plants having Antioxidant potential. *J Pharm Res*, 5: 4278-4287.
- Chandrika UG and Kumarab PAP, 2015. Chapter Four-Gotu Kola (*Centella asiatica*): Nutritional properties and plausible health benefits. *Adv Food Nutr Res*, 76: 125-157.
- Dold A and Cocks M, 2001. Traditional veterinary medicine in the Alice district of the Eastern Cape Province, South Africa: research in action. *S Afr J Sci*, 97: 375-379.
- Dutta N, Mhasalkar M and Fernando G, 1970. A study on the antifertility action of VIDR-2GD: a constituent isolated from the seeds of *Ensete superbum*, Cheesm, Musaceae (Banakadali). *Fertil Steril*, 21: 247.
- Gakuya D, Itonga S, Mbaria J, Muthee J and Musau J, 2013. Ethnobotanical survey of biopesticides and other medicinal plants traditionally used in Meru central district of Kenya. *J Ethnopharmacol*, 145: 547-553.
- Ghaima KK, Rasheed SF and Ahmed EF, 2013. Antibiofilm, antibacterial and antioxidant activities of water extract of *Calendula officinalis* flowers. *Int J Biol Pharm Res*, 4: 465-470.
- Gonçalves CA, Siqueira JM, Carollo CA, de Oliveira Mauro M, de Davi N *et al.*, 2013. Gestational exposure to *Byrsonima verbascifolia*: Teratogenicity, mutagenicity and immunomodulation evaluation in female Swiss mice. *J Ethnopharmacol*, 150: 843-850.
- Gull T, Sultana B, Bhatti IA and Jamil A, 2015. Antibacterial potential of *Capparis spinosa* and *Capparis decidua* extracts. *Int J Agric Biol*, 17: 727-733.
- Gupta AK, 2003. Quality standards of Indian medicinal plants. Volume I. Quality standards of Indian medicinal plants Volume I.
- Haq F, Ahmad H and Alam M, 2011. Traditional uses of medicinal plants of Nandiar Khuwarr catchment (District Battagram), Pakistan. *J Med Plant Res*, 5: 39-48.
- Haque N, Chowdhury S, Nutan M, Rahman G, Rahman K *et al.*, 2000. Evaluation of antitumor activity of some medicinal plants of Bangladesh by potato disk bioassay. *Fitoterapia*, 71: 547-552.
- Harnett S, Oosthuizen V and Van de Venter M, 2005. Anti-HIV activities of organic and aqueous extracts of *Sutherlandia frutescens* and *Lobostemon trigonus*. *J Ethnopharmacol*, 96: 113-119.
- Hegde H, Hegde G and Kholkute S, 2007. Herbal care for reproductive health: ethno medicobotany from Uttara Kannada district in Karnataka, India. *Complement Ther Clin Pract*, 13: 38-45.
- Hossen MJ, 2015. Alternative medicine: Health safety and therapeutic potentialities. *EC Vet Sci*, 1: 28-29.
- Hossen MJ, Baek KS, Kim E, Yang WVS, Jeong D *et al.*, 2015a. *In vivo* and *in vitro* anti-inflammatory activities of *Persicaria chinensis* methanolic extract targeting Src/Syk/NF-kappaB. *J Ethnopharmacol*, 159: 9-16.
- Hossen MJ, Jeon SH, Kim SC, Kim JH, Jeong D *et al.*, 2015b. *In vitro* and *in vivo* anti-inflammatory activity of *Phyllanthus acidus* methanolic extract. *J Ethnopharmacol*, 168: 217-228.
- Hossen MJ, Kim SC, Son YJ, Baek KS, Kim E *et al.*, 2015c. AP-1-targeting anti-inflammatory activity of the methanolic extract of *Persicaria chinensis*. *Evid Based Complement Alternat Med*, 2015: 608126.
- Hossen MJ, Kim SC, Yang S, Kim HG, Jeong D *et al.*, 2015d. PDK1 disruptors and modulators: a patent review. *Expert Opin Ther Pat*, 25: 513-537.
- Hossen MJ, Kim MY, Kim JH and Cho JY, 2016. *Codonopsis lanceolata*: A review of its therapeutic potentials. *Phytother Res*, 30: 347-356.
- Hutchings A, 1996. Zulu medicinal plants: an inventory, University of Natal Press.
- Jain SK, 1991. Dictionary of Indian Folk Medicine and Ethnobotany. Deep publications, India.
- Javed S, Khan JA, Khaliq T, Javed I and Abbas RZ, 2015. Experimental evaluation of nephroprotective potential of *Calotropis procera* (Ait) flowers against gentamicin-induced toxicity in albino rabbits. *Pak Vet J*, 35: 222-226.
- Kadir MF, Sayeed MSB and Mia M, 2012. Ethnopharmacological survey of medicinal plants used by indigenous and tribal people in Rangamati, Bangladesh. *J Ethnopharmacol*, 144: 627-637.
- Karousou R and Deirmentzoglou S, 2011. The herbal market of cyprus: Traditional links and cultural exchanges. *J Ethnopharmacol*, 133: 191-203.
- Khaki A, Fathiazad F, Nouri M, Khaki AA, Khamenehi H *et al.*, 2009. Evaluation of androgenic activity of *Allium cepa* on spermatogenesis in the rat. *Folia Morphol*, 68: 45-51.
- Lai SM, Sudhahar D and Anandarajagopal K, 2012. Evaluation of antibacterial and antifungal activities of *Persicaria chinensis* leaves. *Int J Pharm Sci Res*, 3.
- Liu P, Duan J-a, Hua Y-q, Tang Y-p, Yao X *et al.*, 2011. Effects of Xiang-Fu-Si-Wu decoction and its main components for dysmenorrhea on uterus contraction. *J Ethnopharmacol*, 133: 591-597.

- Luitel DR, Rokaya MB, Timsina B and Munzbergova Z, 2014. Medicinal plants used by the Tamang community in the Makawanpur district of central Nepal. *J Ethnobiol Ethnomed*, 10.
- Luseba D, Elgorashi E, Ntloedibe D and Van Staden J, 2007. Antibacterial, anti-inflammatory and mutagenic effects of some medicinal plants used in South Africa for the treatment of wounds and retained placenta in livestock. *S Afr J Bot.*, 73: 378-383.
- Luseba D and Van der Merwe D, 2006. Ethnoveterinary medicine practices among Tsonga speaking people of South Africa. *Onderstepoort J Vet Res*, 73: 115-122.
- Malla B, Gauchan DP and Chhetri RB, 2015. An ethnobotanical study of medicinal plants used by ethnic people in Parbat district of Western Nepal. *J Ethnopharmacol*, 165: 103-117.
- Malviya N, Jain S, Gupta VB and Vyas S, 2013. Management of drug induced sexual dysfunction in male rats by ethyl acetate fraction of onion. *Acta Pol Pharm*, 70: 317-322.
- Manfo FPT, Nantia EA, Dechaud H, Tchana AN, Zobot M-T *et al.*, 2014. Protective effect of *Basella alba* and *Carpolobia alba* extracts against maneb-induced male infertility. *Pharm Biol*, 52: 97-104.
- Masika P, Van Averbeke W and Sonandi A, 2000. Use of herbal remedies by small-scale farmers to treat livestock diseases in central Eastern Cape Province, South Africa. *J S Afr Vet Assoc*, 71: 87-91.
- McGaw L and Eloff J, 2008. Ethnoveterinary use of southern African plants and scientific evaluation of their medicinal properties. *J Ethnopharmacol*, 119: 559-574.
- McGaw LJ, Van der Merwe D and Eloff JN, 2007. *In vitro* anthelmintic, antibacterial and cytotoxic effects of extracts from plants used in South African ethnoveterinary medicine. *Vet J*, 173: 366-372.
- Mehta K, 2014. Antibacterial and antifungal potentiality of leaf extract of *Phyllanthus fraternus* Webster: An ethnomedicinal plant. *Am J Microbiol Res*, 2: 74-79.
- Meyer J and Dilika F, 1996. Antibacterial activity of *Helichrysum pedunculatum* used in circumcision rites. *J Ethnopharmacol*, 53: 51-54.
- Mogatle S, 2009. African traditional medicines-antiretroviral drug interactions: The effect of African potato (*Hypoxis hemerocallidea*) on the pharmacokinetics of efavirenz in humans, Rhodes University.
- Nadkarni KM, 1976. Indian materia medica with ayurvedic, unani-tibbi, siddha, allopathic, homeopathic, naturopathic and home remedies, appendices and indexes. Bombay, Popular Prakashan.
- Nasir S, Batoool M, Hussain SM *et al.*, 2015. Bioactivity of oils from medicinal plants against immature stages of Dengue mosquito *Aedes aegypti* (Diptera: Culicidae). *Int J Agric Biol*, 17: 843-847.
- Pattanayak P, Behera P, Das D and Panda SK, 2010. *Ocimum sanctum* Linn. A reservoir plant for therapeutic applications: An overview. *Pharmacogn Rev*, 4: 95.
- Peltzer K, Friend-du Preez N, Ramlagan S, Fomundam H, Anderson J *et al.*, 2011. Antiretrovirals and the use of traditional, complementary and alternative medicine by HIV patients in Kwazulu-Natal, South Africa: a longitudinal study. *Afr J Tradit Compl Altern Med*, 8: 337-345.
- Poornima G, Manasa M, Rudrappa D and Prashith K, 2013. Medicinal plants used by herbal healers in Narasipura and Manchale Villages of Sagara Taluk, Karnataka, India. *Sci Tech Art Res J*, 1: 12-17.
- Rajith N, Ambily D, Dan VM, Devi PS, George V *et al.*, 2012. A survey on ethnomedicinal plants used for menstrual disorders in Kerala. *Indian J Trad Knowledge*, 11: 453-460.
- Rao S, Venkaiah M, Padal S and Murty PP, 2010. Ethnomedicinal plants from Paderu division of Visakhapatnam district, AP, India. *J Phytol*, 2.
- Rastogi R, 1998. Mehrotra, Bn Compendium of "Indian Medicinal Plants", Vol. V, CDRI Lucknow and NISC New Delhi, 80: 144-174.
- Sainath RS, Prathiba J and Malathi R, 2009. Antimicrobial properties of the stem bark of *Saraca indica*. *Eur Rev Med Pharmacol Sci*, 13: 371-374.
- Sewani-Rusike CR and Mammen M, 2014. Medicinal plants used as home remedies: A family survey by first year medical students. *Afr J Tradit Complement Altern Med*, 11: 67-72.
- Sharma P, Yelne M and Dennis T, 2001. Database on medicinal plants used in Ayurveda, CCRAS. Department of ISM and H Govt of India, 2.
- Sharma P, Yelne M, Dennis T, Joshi A and Billore K, 2000. Database on medicinal plants used in Ayurveda.
- Singh A, 2008. Review of ethnomedicinal uses and pharmacology of *Evolvulus alsinoides* Linn. *Ethnobot leaflets*, 2008: 100.
- Singh A, 2015. Observations on the wild medicinal flora of Banaras Hindu University main campus, India. *Int J Mod Bio Medi*, 6:1-21.
- Umarji MP and Deepa H, 2011. Advances in the management of female infertility. *Perinatology*: 54. 12: 54-58.
- Upadhyay R, Chaurasia JK, Tiwari KN and Singh K, 2014. Antioxidant property of aerial parts and root of *Phyllanthus fraternus* Webster, an Important Medicinal Plant. *Sci World J*, 2014.
- Van der Merwe D, Swan G and Botha C, 2001. Use of ethnoveterinary medicinal plants in cattle by Setswana-speaking people in the Madikwe area of the North West Province of South Africa. *J S Afr Vet Assoc*, 72: 189-196.
- Verma PK, Raina R, Sultana M, Singh M and Kumar P, 2016. Total antioxidant and oxidant status of plasma and renal tissue of cisplatin-induced nephrotoxic rats: protection by floral extracts of *Calendula officinalis* Linn. *Ren Fail*, 38: 142-150.
- Wang M-Y, West BJ, Jensen CJ, Nowicki D, Su C *et al.*, 2002. *Morinda citrifolia* (Noni): a literature review and recent advances in Noni research. *Acta Pharmacol Sin*, 23: 1127-1141.
- Wei S-M, Yan Z-Z and Zhou J, 2011. *Psoralea corylifolia* protects against testicular torsion/detorsion-induced ischemia/reperfusion injury. *J Ethnopharmacol*, 137: 568-574.
- Winters M, 2006. Ancient medicine, modern use: *Withania somnifera* and its potential role in integrative oncology. *Altern Med Rev*, 11: 269-277.
- Yelne M, Sharma P and Dennis T, 2002. Database on medicinal plants used in Ayurveda. Central Council for Research in Ayurveda & Siddha, New Delhi, 4.
- Zheng S, Liao S, Zou Y, Qu Z, Shen W *et al.*, 2014. Mulberry leaf polyphenols delay aging and regulate fat metabolism via the germline signaling pathway in *Caenorhabditis elegans*. *AGE*, 36: 1-13.