A Review on Herbal Remedies for Sexually Transmitted Infections (STIs) from Melghat Region of Maharashtra State, India

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Authors’ contributions
This work was carried out in collaboration between both the authors. Author NMA designed the study under the supervision of corresponding author DDK. The statistical analysis, protocols and literature searches were managed by NMA. Both the authors analyzed the study and prepared the first draft of the manuscript. After critical thought and agreement in both the authors, the final manuscript was submitted.

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ABSTRACT
Melghat means "meeting of ghats" region well known for "Melghat Tiger Reserve (MTR)" located in the north-western compact block of Amravati district in Maharashtra state, India. This literature review aimed to compile and document the herbal remedies for Sexually Transmitted Infections (STIs) as Gonorrhoea, anti-HIV Leucorrhoea, Sexual Transmitted Diseases (STDs), and Syphilis in Melghat region. A total of 167 medicinal plant species from Melghat distributed among 137 genera, and 66 families have complied for Gonorrhea (103), Syphilis (85), Leucorrhoea (84), anti-HIV (10), and STD (01). Plant families like Lythraceae (17 species), Malvaceae (11 species), Moraceae (8 species), Euphorbiaceae (8 species), Acanthaceae (6 species), Amaranthaceae (6 species), Verbenaceae (6 species), were most frequently occurred in the study. Trees represented 34.13% of species, followed by Herbs (32.33%), Shrubs (20.95%), Climbers (10.17%), Grasses (1.19%),

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Orchids (0.59%) and Aquatic (0.59%). Leaves were the most commonly used plant parts; it accounts 19% followed by roots (18%), whole plant (13%), bark (13%), seeds (7%), fruits (6%), stem (5%), flowers (5%), etc. Curated data presented as botanical names, families, local names, habitat, floristic area (in Melghat), ailments, part used with relevant ethnobotanical citations were documented and thus offers scope for researchers engaged in herbal drug discovery and development.

Keywords: Medicinal plants; Melghat Flora; Gonorrhoea; Leucorrhoea; Syphilis; HIV; STIs.

1. INTRODUCTION

Melghat is a unique ecological niche situated in the north-western part of the Amravati district from the Vidarbha region of Maharashtra state in India. Melghat means' meeting of the ghats', lies in the south-western Satpura mountain ranges on the border of Madhya Pradesh state. Melghat comprising of two blocks, Dharni and Chikhaldhara, situated in Amravati district, is home to the "Melghat Tiger Reserve (MTR)" of Maharashtra. The tribal population lives in over an area of 4212 sq.km, out of which 77% area is under forest. It is a hilly area spreading across 320 villages comprising mainly of the Korku tribe [1]. The tribal population mainly includes Korkus, Gond, and Nihals. Both floristics and ethnobotany of the Melghat area are well studied.

Over the period, many changes in vegetation are expected. Floristic documentation of Melghat started with the administration of Melghat Forests being transferred to Britishers by Nizam of Hyderabad. Mostly the angiosperms have been studied. However, some efforts are also made to document the biodiversity of lower plants, especially bryophytes, ferns, and mushrooms. The first detailed account of the "Flora of Melghat" was published by Patel RI in 1968 [2], who himself was a forest officer. The notable published work is by Dhore MA and Joshi PA in 1988 [3], Bhogaonkar and Devarkar in 1999 [4], Bhogaonkar and Devarkar in 2001 [5], Devarkar in 2001 [6], Londhe et al. in 2002 [7], Bhogaonkar and Devarkar in 2002 [8], Sakarkar et al. in 2004 [9], Shirsat in 2008 [10], Bhogaonkar et al. in 2010 [11], Yeotkar et al. in 2010 [12], Devarkar in 2010 [13], Rothe et al. in 2011 [14], Ingole in 2011 [15], Kokate and Muratkar in 2012 [16], Zade et al. in 2013 [17], Khedkar and Oke in 2013 [18], Birdi et al. in 2014 [1], Talapalliwar and Garg in 2014 [19], Kashyap et al. in 2016 [20], Bhogaonkar and Dhole in 2018 [21] and Khedkar and Atre in 2019 [22]. Their works make few passing references to mention ethnobotanical, medicinal, edible, or otherwise use of plant species from Melghat.

The older terminology of "Venereal Diseases" (VDs) largely has been superseded in the past 50 years by "Sexually Transmitted Diseases" (STDs), and more recently by "Sexually Transmitted Infections" (STIs) [23]. STIs are more powerful than different contaminations winning in the community. "Leucorrhoea" or "Leucorrhoea" or "vaginal release" is a typical grievance among ladies. It generally denotes thick whitish, yellowish, or greenish vaginal discharge in females that might be normal or a symptom of infection. It is almost mucus discharge, which exhibits exfoliation of vaginal epithelial cells due to estrogen influence on the vaginal mucosa [23]. The amount of vaginal discharge may increase due to vaginal infection and due to STIs, and the discharge may disappear or reappear from time to time. The common causes of this disease are excessive coitus, abortion, high parity, lower socioeconomic status, poor hygiene, faulty dietary habits, excessive workload, etc. Mainly two types of leucorrhoea appear: first physiological leucorrhoea is due to the stimulation of estrogens leads to changes in vaginal epithelium, changes in healthy bacterial flora and pH of vaginal secretion; second pathological leucorrhoea, different pathogens like Candida albicans, Neisseria gonorrhoea, Trichomonas vaginalis are exclusively involved, and some other potential agents like Candida-like organisms (CLO), Chlamydia trachomatis, Streptococci, and Ureaplasma urealyticum are responsible [23].

"Gonorrhoea" or "gonorrhoea" or "the clap" is the second most common sexually transmitted disease (STD) worldwide, caused by the bacterium Neisseria gonorrhoeae. It is most common in young adults. The bacteria grow in warm, moist areas of the body, i.e. urethra. In women, the bacteria may be found in the reproductive tract. The bacteria can also grow in the eyes. The bacteria can infect the mouth,
genital tract, or anus. Generally spreads during a vaginal, oral, or anal sexual encounter with an infected partner. Syndromes include cervicitis in women and urethritis, proctitis, and pharyngitis in both men and women [24]. Although infection is often asymptomatic, it is the main cause of infertility nowadays, and if untreated, it can develop into more infectious diseases known as Pelvic Inflammatory Diseases (PIDs). As it’s a sexually transmitted disease, but it can be passed from a pregnant woman to her baby lead to the newborn baby having an infection of the eyes, and if untreated may lead to blindness. *Gonorrhea* *Obg protein*, belonging to the Obg/CgtA GTPase subfamily, is identified as a molecular target for the development of drugs with new mechanisms of action against gonorrhea [25]. Drug resistance, especially for gonorrhoea, is a significant threat to reducing the impact of STIs worldwide.

Syphilis, known in India as "Portuguese disease" or "firança" or "firangi roga," reached the subcontinent in the early 16th century and soon became widespread [26]. Syphilis is caused by bacteria *Treponema pallidum*. Syphilis can cause neurological, cardiovascular, and dermatological diseases in adults, and stillbirth, neonatal death, premature delivery, or severe disability in infants [27]. The primary route of transmission of STIs is through sexual contact and mainly caused by bacteria, viruses, or protozoa. In the developed world, viral STIs have become increasingly common and important, whereas, in developing countries, bacterial STIs are more common [28].

World Health Organisation (WHO) in 2017 said, the data from 77 countries revealed that antibiotic resistance is making gonorrhoea difficult, and sometimes impossible, to treat. Recently, the World Health Organization (WHO) estimated that 80 percent of people around the world depend on herbal medicines for primary health care needs. WHO also estimated that more than 21,000 plant species have the potential for being used as medicinal plants (WHO, 2004). In India, around 20,000 medicinal plants have been recorded; however, traditional practitioners use near to 7500 plants for curing different diseases [29].

2. MATERIALS AND METHODS

2.1 Data Retrieval

The traditional uses of medicinal plants used for the management of STI for Melghat plants were collected from different research literature conducted. The published literature was searched on journal articles using international scientific databases such as Google Scholar, MEDLINE, NLM, PubMed, PubMed Central, Research Gate, Science Direct, Scopus, Web of Science, etc.

Pieces of literature were searched on databases comprising information on medicinal plants used for the management of STI for Melghat plants were browsed using the following main search terms: 'Melghat Flora / Melghat medicinal flora'; 'Medicinal plants for sexually transmitted infections/diseases,' 'Leucorrhoea / Leucorrhoea / Anti-Leucorrhoea / Anti-Leucorrhoea,' 'Medicinal plants for Leucorrhoea / Leucorrhoea'; "Gonorrhea / Gonorrhea / Anti-Gonorrhoea / Anti-gonorrhoea, "Medicinal plants for 'Gonorrhea / Gonorrhea,' 'Anti-Gonorrhea plants in Melghat'; Syphilis / Anti- Syphilis', "Medicinal plants for Syphilis"; 'Ethnobotanical study of medicinal plants," Ethnomedicinal study in Melghat / Melghat tiger reserve (MTR), "Traditional knowledge and Traditional medicinal plants in Melghat,' "Ethnobotanical study of medicinal plants", Ethnopharmaceutical and Ethnopharmacology.

Data on Ethnobotanical study of medicinal plants used for STI collected from the web-based literature were included the scientific and local names, the habit of the plant in Melghat, medicinal parts used with relevant references and compiled after assessing all available ethnobotanical documents in Melghat. A literature search was also done to document the pharmacological activities of the documented plant species.

2.2 Data Analysis

Ethnobotanical literature data was entered in an Excel spreadsheet analyzed through statistical analysis. Quantitative literature data were compiled and analyzed by using descriptive statistics to identify the number and percentage of species, genera, and families. The analyzed data were expressed in table and graphs. The yield of this survey can fill in as a reason for future pharmacological examinations on restorative plants establishes in Melghat plants utilized for the administration of STI.

3. RESULTS AND DISCUSSION

A total of 167 plants from the Melghat region belonged to 137 genera, and 66 families were complied within this review. Both published and unpublished research reports were used for compiling the review.
| Sr. No. | Botanical names                  | Families     | LN            | Ha            | FA (in Melghat) | Ailments              | PU                  | References          |
|---------|---------------------------------|--------------|---------------|---------------|----------------|-----------------------|----------------------|---------------------|
| 1.      | *Abrus precatorius* L.          | Lythraceae   | Gun; Gunchi;  | Shrubs        | Throughout     | Gonorrhea             | Whole plant; Roots; | [3,21,28,30]       |
| 2.      | *Abutilon indicum* (L.) Sweet   | Malvaceae    | Tepari; Kanghi; | Shrubs        | Semadoh        | Gonorrhea             | Seed; Leaves; Root bark; | [3,13,21,31]      |
|         |                                  |              |               |               |                | Leucorrhoea           | Roots;              | [32,33]            |
| 3.      | *Acacia catechu* (L.f.) Willd.  | Lythraceae   | Khair         | Tree          | Harisal, Dhargad | Gonorrhea             | Whole plant;        | [3,21,28]          |
| 4.      | *Acacia nilotica* (L.) Delile   | Mimosoideae  | Tepari; Kanghi; | Tree          | Semadoh        | Gonorrhea             | Leaves;             | [21,30]            |
|         |                                  |              |               |               |                | Leucorrhoea           | Bark, Roots; Leaves, Bark, Gum; | [32,34]          |
| 5.      | *Achyranthes aspera* L.         | Amaranthaceae | Aghada;      | Herbs         | Very common    | Gonorrhea             | Roots; Fruits; Root, Leaves; | [3,8,21,28]      |
|         |                                  |              |               |               |                | Syphilis              | Leaves;             | [35]                |
| 6.      | *Aegle marmelos* L.             | Rutaceae     | Maika; Bela;  | Tree          | Common         | Leucorrhoea           | Leaves;             | [3,21,32]          |
| 7.      | *Aerva javanica* (Burm. f.) Juss.| Amaranthaceae | Buee          | Herbs         | Harisal        | Gonorrhea             | Roots;              | [7,8,21]           |
| 8.      | *Aerva lanata* (L.) Juss. Ex Schult. | Amaranthaceae | Polpala; Chaya; | Herbs         | Fairly frequent in diverse habitats | Gonorrhea             | Flowers;            | [3,21,31]          |
|         |                                  |              |               |               |                | Leucorrhoea           | Whole plant; Roots; | [37,38]            |
| 9.      | *Ageratum conyzoides* L.        | Asteraceae   | Gha buti; Bhakumba; | Herbs         | Common         | Gonorrhea             | Roots; Leaves;      | [3,21,39,40,41]    |
|         |                                  |              |               |               |                | Leucorrhoea           | Leaves;             | [32,42]            |
|         |                                  |              |               |               |                | Syphilis              | Whole plant;        | [41]                |
|         |                                  |              |               |               |                | HIV / AIDS            | Leaves; Whole plant; | [40,41,42]         |
| 10.     | *Albizia lebbeck* (L.) Benth.   | Lythraceae   | Siris; Bhingri; | Tree          | Planted        | Gonorrhea             | Bark, Seed, flower, pods; | [3,21,35,43]      |
|         |                                  |              |               |               |                | Leucorrhoea           | Leaves, seed, bark; | [43]                |
| 11.     | *Albizia procera* (Roxb.) Benth.| Leguminosae  | Kinhai        | Tree          | Chikhaldara    | Gonorrhea             | Seed;               | [3,21,44]          |
| 12.     | *Allanthis excelsa* Roxb.       | Simaroubaceae | Maharukh      | Tree          | Planted        | Gonorrhea             | Bark;               | [3,21,45]          |
|         |                                  |              |               |               |                | Leucorrhoea           | Bark;               | [45]                |
| 13.     | *Alternanthera pungens* Kunth    | Amaranthaceae | Khahi weed    | Herbs         | Occasional     | Gonorrhea             | Tubers, Whole plant; Whole plant; | [3,21,46,47]      |
| 14.     | *Amaranthus spinosus* L.        | Amaranthaceae | Kate-Math;    | Herbs         | Frequent       | Gonorrhea             | Roots, Stem; Whole plant; Leaves; | [3,28,35,40,44,48] |
|         |                                  |              |               |               |                | Leucorrhoea           | Roots; Whole plant; Tender shoot; | [32,48,49,50]     |
| 15.     | *Anacardium occidentale* L.     | Anacardiaceae | Kaju;         | Tree          | Occasionally planted in forest | Gonorrhea             | Leaves; Leaves;     | [21,28,51]         |
|         |                                  |              |               |               |                | Syphilis              | Fruits;             | [52]                |
| 16.     | *Andrographis paniculata*       | Acanthaceae  | Kalmegh;      | Herbs         | Makhala plateau | HIV / AIDS            | Leaves;             | [4,53]             |
| 17.     | *Argemone mexicana* L.          | Papaveraceae | Killai; Pivia Dhotra; | Herbs         | Common         | Gonorrhea             | Roots, Seeds;       | [3,28]             |
|         |                                  |              |               |               |                | Leucorrhoea           | Whole plant; Roots, Seeds; | [44,54]            |
| Sr. No. | Botanical names              | Families              | LN             | Ha                     | FA (in Melghat)                | Ailments                              | PU                          | References |
|---------|----------------------------|-----------------------|----------------|------------------------|-------------------------------|---------------------------------------|-----------------------------|------------|
| 18.     | Argyreia nervosa (Burm. F.) | Convolvulaceae        | Ghav bel;      | Climbers               | Around villages               | Syphilis; Roots;                      | [28]            |            |
|         | Bojer                      |                       |                |                        |                               | Gonorhea; Leaves;                    | [21, 55]        |            |
| 19.     | Arisaema leschenaultii     | Araceae               | Lily           | Herbs                  | Rare; on road side           | Gonorhea; Whole plant;                | [21, 56]        |            |
|         | Blume                      |                       |                |                        |                               | Syphilis; Whole plant;               | [56]            |            |
| 20.     | Asparagus racemosus Wild.  | Asparagaceae          | Shatavari;     | Shrubs                 | Frequent                      | Gonorhea; Leavels; Whole plant;       | [3, 32, 33, 38, 48] |            |
|         |                           |                       |                |                        |                               | Syphilis; Whole plant;               | [44]            |            |
| 21.     | Atylosia scarabaeoides (L.)| Lythraceae            | Ran Tur;       | Herbs                  | Common, in forest undergrowth| Gonorhea; Leavels; Whole plant;       | [3, 44]         |            |
|         | Benth.                     |                       |                |                        |                               | Syphilis; Leavels; Whole plant;       | [44]            |            |
| 22.     | Azadirachta indica A. Juss.| Meliaceae             | Limbasi; Neem; | Tree                   | Planted; on foot hills of Melghat. | Gonorhea; Leavels; Leaves; Bark;     | [21, 39, 40]    |            |
|         |                           |                       |                |                        |                               | Leucorrhoea Bark;                     | [57]            |            |
| 23.     | Azanza lampas (Cav.) Alef. | Malvaceae             | Chichandur;    | Shrubs                 | Common                        | Gonorhea; Roots, Fruits;             | [3, 58]         |            |
|         |                           |                       | Jangli kapas;  |                        |                               | Syphilis; Roots, Fruits;             | [58]            |            |
| 24.     | Bauhinia malabarica Roxb.  | Lythraceae            | Kangali;       | Tree                   | Common                        | Leucorrhoea Bark;                     | [3, 32]         |            |
|         |                           |                       | Kollarli;      |                        |                               | Leucorrhoea Bark;                     | [3, 32]         |            |
| 25.     | Bauhinia purpurea L.       | Lythraceae            | Tree          | Occasional             |                               | Leucorrhoea Bark;                     | [3, 32]         |            |
| 26.     | Bauhinia variegata L.      | Lythraceae            | Kachnar        | Tree                   | -                             | Syphilis; Leaves, Bark;              | [3, 44]         |            |
| 27.     | Biophytum sensitivum (L.) DC. | Oxalidaceae        | Lajalu         | Herbs                  | Common                        | Gonorhea; Roots;                     | [3, 31, 59]     |            |
| 28.     | Boehravia diffusa L.       | Nyctaginaceae        | Khaparkuoti;   | Herbs                  | Common                        | Gonorhea; Aerial part; Leaves;        | [3, 35, 40]     |            |
|         |                           |                       |                |                        |                               | Leucorrhoea Whole plant;             | [32, 46, 57]    |            |
| 29.     | Bombax ceiba L             | Malvaceae             | Semal; Auri;   | Tree                   | Occasional                    | Gonorhea; Seeds; Bark;                | [3, 60]         |            |
|         |                           |                       |                |                        |                               | Leucorrhoea Roots; Flowers;          | [32, 38, 60]    |            |
| 30.     | Boswellia serrata Roxb.    | Burseraceae           | Salai;         | Tree                   | Outer hills                   | Gonorhea; Gum-resin oil;             | [3, 61]         |            |
|         |                           |                       |                |                        |                               | Syphilis; Gum-resin;                 | [61]            |            |
| 31.     | Butea monosperma Roxb.     | Lythraceae            | Dhak; Palas;   | Tree                   | Hills of Melghat              | Gonorhea; Bark, Flowers;             | [3, 31, 62]     |            |
|         |                           |                       |                |                        |                               | Leucorrhoea Bark, Flower, Gum;       | [32, 48]        |            |
| 32.     | Caesalpinia decapetala (Roth) | Leguminosae         | Chilliari;     | Shrubs                 | Chikkaldara                   | Gonorhea; Roots;                     | [3, 46, 47]     |            |
| 33.     | Calotropis gigantea (L.)   | Asclepiadaceae       | Rui            | Shrubs                 | On bunds fields               | Leucorrhoea Roots;                   | [3, 48]         |            |
|         |                           |                       |                |                        |                               | Syphilis; Bark;                      | [35]            |            |
| 34.     | Calotropis procera (Alton) | Asclepiadaceae       | Rui            | Shrubs                 | Occasional                    | Syphilis; Roots;                     | [3, 63]         |            |
| 35.     | Cardiospermum halicacabum  | Sapindaceae          | Kapalphodi;    | Climbers               | Hedges Fields                 | Gonorhea; Plant Juice;               | [3, 31]         |            |
|         | L.                        |                       |                |                        |                               | Leucorrhoea Roots;                   | [38]            |            |
| 36.     | Cassia hirsute L.          | Caesalpinaceae       | Chakunda       | Shrubs                 | Semadoh                       | Leucorrhoea Roots;                   | [4, 13]         |            |
| 37.     | Cassia fistula L.          | Caesalpinaceae       | Rera, Banaka   | Tree                   | Common                        | Syphilis; Bark;                      | [3, 64]         |            |
| Sr. No. | Botanical names | Families | LN Ha | FA (in Melghat) | Ailments | PU | References |
|---------|----------------|----------|-------|----------------|----------|----|------------|
| 38. | *Cassia occidentalis* L. | Caesalpiniaeae | Chakwar | Shrubs | Around villages | Gonorrhea | Roots; | [3, 30] |
| 39. | *Celastrus paniculatus* Wild. | Celastraeae | Malkangi; | Shrubs | Occasional | Leucorrhoea | Bark, Root; Root bark; | [3, 38, 65] |
| 40. | *Celosia argentea* L. | Amaranthaceae | Kardu; | Herbs | slopes and fields | Leucorrhoea | Flower, Seed; Stem, Leaves; | [3, 35] |
| 41. | *Ceratophyllum demersum* L. | Ceratophyllaceae | Jalaja; | Aquatic | Tapi, Dolar Pool | Leucorrhoea | Whole plant; | [3, 66] |
| 42. | *Chlorophytm arundinaceum* Baker | Liliaceae | Mush Bhed; | Herbs | Seemadoh | Gonorrhoea | Tubers; | [7, 67] |
| 43. | *Chlorophytum tuberosum* (Roxb.) | Liliaceae | Gangajata; | Herbs | Common | Leucorrhoea | Tubers; | [3, 68] |
| 44. | *Cissus quadrangularis* Vitaceae | Vitaceae | Kandvel; Had- | Climbers | villages in hedges | Gonorrhoea | Whole plant; Roots; Whole plant; | [21, 28, 39, 51] |
| 45. | *Clerodendrum viscosum* Vent. | Verbenaceae | Bhant; | Shrubs | Chikhaldara | Leucorrhoea | Root, Leaves; | [3, 32] |
| 46. | *Cocculus hirsutus* (L.) Diels | Menispermacaeae | Wasan-vel, | Shrubs | Common | Gonorrhoea | Leaves; | [3, 31, 69] |
| 47. | *Cochlospermum religiosum* (L.) | Bixaceae | Gongal; Ganai; | Tree | Belkund, Koha | Gonorrhoea | Bark gum; Flower, Gum; | [3, 45] |
| 48. | *Coix lacryma-jobi* L. | Gramineae | Adlay | Grasses | - | Gonorrhoea | Seed; | [16, 35] |
| 49. | *Commiphora wightii* (Am.) | Burseraceae | Guggul; | Shrubs | Rare | Leucorrhoea | Latex; | [21, 32] |
| 50. | *Conchus aseatus* L. | Malvaceae | Hade-ka-khet | Herbs | Hill slopes | Gonorrhoea | Roots, Leaves; | [3, 70] |
| 51. | *Cordia dichotoma* Forster. F., | Boraginaceae | Chilu; | Tree | Occasional | Gonorrhoea | Leaves, Stem bark; | [3, 71] |
| 52. | *Costus speciosus* (J. Koenig.) | Costaceae | Cana-reed | Herbs | Harisal, Kokkhas | Gonorrhoea | Leaves, Roots; | [3, 28] |
| 53. | *Crotalaria calyicina* Schrank | Laguminosae | Kosal tag | Herbs | - | Syphilis | Whole plant; | [3, 44] |
| 54. | *Cryptoplepis buchanani* | Asclepiadaceae | Kala bel | Herbs | - | Syphilis | Latex, Roots, Whole plant; | [3, 44] |
| 55. | *Eleolepis gurini* (Burm. F.) | Cucurbitaceae | Kollanokvai | Climbers | around on hedges | Gonorrhoea | Fruits; | [21, 72] |
| 56. | *Cucurbitus prophetarum* L. | Cucurbitaceae | Kharchvit; | Climbers | Semadoh, | Gonorrhoea | Fruits; | [4, 39] |
| 57. | *Cullen corylifolium* Roem. | Faboideae | - | Herbs | - | Leucorrhoea | Seed; | [21, 35] |
| 58. | *Curculigo orchioides* Gaertn. | Hypoxidaceae | Kali Musali | Herbs | Fairly common in entire hilly tract | Gonorrhoea | Roots; Rhizome; | [3, 28, 44, 59] |
| 59. | *Cuscuta reflexa* Roxb. | Cuscutaceae | Amarvel | Herbs | Not common | Leucorrhoea | Whole plant; | [3, 32] |
| 60. | *Cynodon dactylon* (L.) Pers. | Poaceae | Hariyali; | Grasses | Belkund | Leucorrhoea | Whole plant; | [3, 32] |
| Sr. No. | Botanical names                  | Families               | LN            | Ha       | FA (in Melghat) | Allments                  | PU                                      | References |
|--------|---------------------------------|------------------------|---------------|----------|----------------|--------------------------|-----------------------------------------|------------|
| 61     | *Dalbergia latifolia* Roxb.     | Lythraceae             | Shishum; Tree | Occasional | Gonorrhea      | Leaves;                 | [3, 30]                                  |            |
| 62     | *Dalbergia sissoo* DC.          | Faboideae              | Sissu; Tree   | Was planted as avenue tree | Gonorrhea | Leaves, Bark, Roots; | [21, 31, 48, 50]                       |            |
| 63     | *Dalbergia volubilis* Roxb.     | Faboideae              | Alai; Climbers | Semadoh area | Gonorrhea | Roots;                 | [21, 73]                                  |            |
| 64     | *Dendrophthoe falcata* (L.f.)   | Loranthaceae           | Vanda; Shrubs | Fairly common, | Leucorrhoea | Whole plant;            | [3, 38]                                  |            |
| 65     | *Dichrostachys cinerea* (L.)    | Mimosoideae            | Yelatri; Shrubs | At hill feet | Gonorrhea | Roots;                 | [21, 74]                                  |            |
| 66     | *Dioscorea alata* L.            | Dioscoreaceae          | Goradu; Climbers | Chikhaldara | Gonorrhea | Stem;                  | [21, 39]                                  |            |
| 67     | *Dioscorea bulbifera* L.        | Dioscoreaceae          | Gathalu; Climbers | Common | Syphilis | Leaves;                | [3, 49]                                  |            |
| 68     | *Dipteracanthus patulus* (Jacq.)| Acanthaceae            | Grandhi mayakam | Herbs | Occasional, on hill slopes of Dhargad | Gonorrhea | Leaves;                | [3, 75]                                  |            |
| 69     | *Dipteracanthus prostratus* (Poir.) | Acanthaceae        | Pottakanchi | Herbs | Umarkhad | Gonorrhea | Whole plant;             | [7, 76]                                  |            |
| 70     | *Dregea volubilis* (L.f.)       | Apocynaceae            | Harandodi | Shrubs | - | Gonorrhea | Leaves;                | [3, 35]                                  |            |
| 71     | *Eclipta prostrata* (L.)        | Asteraceae             | Maka | Herbs | streams, river beds | Leucorrhoea | Whole plant;          | [3, 77]                                  |            |
| 72     | *Ehretia laevis* Roxb.          | Boraginaceae           | Chamrur | Tree | - | Syphilis | Root, Leaves;         | [21, 44, 45]                              |            |
| 73     | *Elephantopus scaber* L.        | Asteraceae             | Chhatre | Herbs | Drying ponds | Leucorrhoea | Root;                 | [3, 35]                                  |            |
| 74     | *Embelica officinalis* Gaertn.  | Euphorbiaceae          | Aola | Tree | Fairly common | Leucorrhoea | Fruits;               | [3, 32, 33]                              |            |
| 75     | *Ensete superbum* (Roxb.)       | Musaceae               | Jangli Keli | Herbs | Higher elevations | Leucorrhoea | Seeds;                | [3, 78]                                  |            |
| 76     | *Eranthis roseum Vahl.* R. Br. | Acanthaceae            | Dasmuli | Herbs | Chikhaldara | Leucorrhoea | Roots;                | [3, 79]                                  |            |
| 77     | *Euphorbia hirta* L.            | Euphorbiaceae          | Dudhi | Herbs | Common | Leucorrhoea | Whole plant; Leaves; | [3, 32, 38]                              |            |
| 78     | *Euphorbia nilifolia* L.        | Euphorbiaceae          | Thuar | Herbs | Chikhaldara | Gonorrhea | Latex;                | [3, 80]                                  |            |
| 79     | *Evolvulus alsinoides* (L.) L.  | Convolvulaceae         | Shankpushpi | Herbs | Common | Syphilis | Whole plant;             | [3, 81]                                  |            |
| 80     | *Ficus benghalensis* L.         | Moraceae               | Wora; Wad | Tree | Fairly common | Leucorrhoea | Root bark, Stem bark, Whole plant, Latex, bark, leaves, Seed; | [32, 44, 48, 57] |            |
| 81     | *Ficus exasperata* Vahl         | Moraceae               | Karvat | Tree | Semadoh | Gonorrhea | Leaves, Bark, Leaves; | [7, 40, 51]                              |            |
| 82     | *Ficus hispida* L. f.           | Moraceae               | Khat- Umer, | Tree | On mud flats | Leucorrhoea | Ripe fruits, Bark; | [3, 32, 45]                              |            |
| 83     | *Ficus lacor* Buch-Ham          | Moraceae               | Pipri serilli; Tree | All over Melghat | Leucorrhoea | Bark, Buds; | [21, 83]                                  |            |
| Sr. No. | Botanical names                  | Families          | LN                           | Ha        | FA (in Melghat)            | Ailments               | PU                                      | References                  |
|--------|----------------------------------|-------------------|------------------------------|-----------|---------------------------|------------------------|-----------------------------------------|----------------------------|
| 84.    | **Ficus racemosa** L.            | Moraceae          | Tree                         | Occasional| Gonorrhoea                | Bark; Fruits;          | [3, 57]                                |                             |
| 85.    | **Ficus religiosa** L.           | Moraceae          | Tree                         | Occasional| Gonorrhoea                | Leaves, tender shoots, Latex; Bark; | [3, 44, 57]                            |                             |
| 86.    | **Ficus virens** W. T. Aiton     | Moraceae          | Tree                         | Occasional| Leucorrhoea               | Leaves, Bark;         | [3, 44]                                |                             |
| 87.    | **Placodium indicum (Burm. F.)** | Flacourtiaeae     | Tree                         | Common    | Leucorrhoea               | Stem;                 | [3, 38]                                |                             |
| 88.    | **Gloriosa superba** L.          | Liliaceae         | Climbers                     | Common    | Gonorrhoea                | Whole plant; Aerial part; Tubers; | [3,28,35,40,44,82]          |                             |
| 89.    | **Gmelina arborea** Roxb.        | Verbenaceae       | Tree                         | Occasional| Gonorrhoea                | Roots; Bark; Root bark; Leaves; | [3, 40, 49]                            |                             |
| 90.    | **Grewia tilifolia** Vahl.       | Malvaceae         | Tree                         | Common    | Syphilis                  | Roots, Bark, Leaves, Flowers; | [3, 44]                                |                             |
| 91.    | **Heliotropium ovalifolium** Forssk. | Boraginaceae    | Herbs                        | Stream and river | Syphilis                  | Whole plant;          | [3, 84]                                |                             |
| 92.    | **Hemidesmus indicus** (L.) R. Br. | Apocynaceae      | Shrubs                       | At hill forests | Syphilis                  | Roots; Stems;        | [3, 28, 48]                            |                             |
| 93.    | **Holarrhena antidysenterica** L. | Apocynaceae      | Tree                         | Common    | Leucorrhoea               | Root bark;            | [3, 38]                                |                             |
| 94.    | **Hybanthus enneaspermus** (L.)  | Violaceae         | Herbs                        | Occasional| Gonorrhoea                | Root;                 | [21, 85]                               |                             |
| 95.    | **Hygrophila auriculata**        | Acanthaceae       | Herbs                        | streams and rivers | Leucorrhoea               | Whole plant, leaves;| [3, 86]                                |                             |
| 96.    | **Jatropha curcas** L.           | Euphorbiaceae     | Shrubs                       | Occasional in villages | Gonorrhoea               | Leaves;              | [3, 28, 51]                            |                             |
|        |                                  |                   |                              |           |                           | Leaves; Stem, Sap;   | [28, 51]                               |                             |
|        |                                  |                   |                              |           |                           | HIV / AIDS;          | Leaves;                               |                             |
| 97.    | **Justicia procumbens** L.       | Acanthaceae       | Ghali Pit papad             | Herbs     | Common                   | HIV / AIDS;           | Whole plant;                          | [3, 88]                    |
| 98.    | **Lantana camara** L.            | Verbenaceae       | Shrubs                       | Very common| Gonorrhoea                | Roots;                | [3, 39]                                |                             |
| 99.    | **Leptadenia reticulata** (Retz.)| Apocynaceae      | Shrubs                       | Rare       | Gonorrhoea                | Roots;                | [3, 39]                                |                             |
| 100.   | **Limonia acidissima** Linn.     | Rutaceae          | Tree                         | Around villages | Leucorrhoea               | Fruits;              | [21, 45]                               |                             |
| 101.   | **Litsea glutinosa** (Lour.) C. B. Rob. | Lauraceae       | Tree                         | In Chikhaladara range and Kotu | Gonorrhoea               | Leaves;              | [3, 28]                                |                             |
| 102.   | **Luffa acutangula** (L.) Roxb. | Cucurbitaceae     | Climmers                     | In Dhargad, Kelpani and Jarida | Leucorrhoea               | Stem bark; Stem bark;| [3, 38]                                |                             |
| 103.   | **Macrotyloma uniflorum** (Lam.) | Lythraceae        | Climmers                     | Gullarghat | Leucorrhoea               | Roots;                | [4, 44]                                |                             |
| 104.   | **Magnolia champaca** (L.) Baill. | Magnoliaceae     | Tree                         | -          | Gonorrhoea                | Flowers;              | [21, 35]                               |                             |
| Sr. No. | Botanical names | Families | LN | Ha | FA (in Melghat) | Ailments | PU | References |
|---------|----------------|----------|----|----|----------------|----------|----|------------|
| 105.    | Mallotus philippensis (Lam.) | Euphorbiaceae | Sendri; | Tree | Higher elevations | HIV / AIDS | Fruits; | [3, 50] |
| 106.    | Mangifera indica L. | Anacardiaceae | Amba; Am; | Tree | Grows as wild in some deep ravines on hill slopes | Gonorrhea | Leaves; | [3, 28, 51] |
|         |                 |           |       |     |                | Syphilis | Leaves; | [28, 51] |
|         |                 |           |       |     |                | HIV / AIDS | Stem bark; | [9] |
|         |                 |           |       |     |                | Leucorrhoea | Stem bark, Leaves, Flowers; Seed; | [32, 33, 48, 57, 91] |
| 107.    | Mimusops elengi L. | Sapotaceae | Bakul | Tree | Planted | Gonorrhea | Roots; | [21, 52] |
|         |                 |           |       |     |                | Leucorrhoea | Flower; | [45] |
| 108.    | Momordica balsamina sensu | Cucurbiteae | bara-karela; barh karelo; | Climbers | Rare; along road from Chikhaldara to Kolkhas | Syphilis | Roots; Leaves; | [4, 30] |
|         |                 |           |       |     |                | Gonorrhea | Whole plant; | [30] |
|         |                 |           |       |     |                | HIV / AIDS | Fruit; | [30] |
| 109.    | Moringa oleifera Lam | Moringaceae | Senja; Shevga; | Tree | Planted | Gonorrhea | Seeds; | [3, 93] |
|         |                 |           |       |     |                | Leucorrhoea | Seeds; | [3, 46] |
|         |                 |           |       |     |                | Syphilis | Leaves; | [93] |
| 110.    | Mucuna pruriens (L.) DC. | Lythraceae | Khajkuyari; | Shrubs | Frequent; | Gonorrhea | Whole plant; | [3, 44] |
|         |                 |           |       |     |                | Leucorrhoea | Whole plant; | [3, 44] |
| 111.    | Nepeta hindostana (Roth) Haines | Lamiaceae | Badranj boya; | Herbs | Chikhaldara | Gonorrhea | Whole plant; | [3, 44] |
|         |                 |           |       |     |                | Leucorrhoea | Whole plant; | [3, 44] |

**Atre and Khedkar; EJMP, 31(14): 1-17, 2020; Article no.EJMP.60797**
| Sr. No. | Botanical names                     | Families                  | LN                          | Ha          | FA (in Melghat)                  | Ailments                    | PU                | References |
|---------|-------------------------------------|---------------------------|-----------------------------|-------------|---------------------------------|-----------------------------|----------------------|-------------|
| 128     | *Salvia plebeia* R.Br.              | Lamiaceae                 | Kamrkash                    | Herbs       | Drying ponds                    | Syphilis                     | Roots;              | [97]        |
| 129     | *Santalum album* L.                 | Santalaceae               | Chandan;                    | Tree        | On bordering hills              | Gonorrhea                    | Leaves; Wood;       | [21, 44]    |
| 130     | *Scoparia dulcis* L.                | Plantaginaceae            | Madhukam                    | Herbs       | Rare, in river beds             | Gonorrhea                    | Whole plant; Leaves; | [3, 28, 35, 40, 44] |
| 131     | *Semecarpus anacardium* L.          | Anacardiaceae             | Bhilawa; Dhargad, Bori      | Tree        | Plant                           | Syphilis; Seeds;            |                    | [3, 48]      |
| 132     | *Shorea robusta* Gaerthn.           | Dipterocarpaceae          | Guggilu; Rala;              | Tree        | Plant                           | Gonorrhea                    | Leaves; Bark; Seed;  | [21, 31, 44] |
| 133     | *Sida acuta* Burm. F.               | Malvaceae                 | Chikna; Kharantti;          | Shrubs      | Very common                     | Gonorrhea                    | Leaves; Roots; Seeds;| [3, 31, 44, 48, 82] |
| 134     | *Sida cordata* (Burm.f.) Borss.     | Malvaceae                 | Kharentli; Bala;            | Herbs       | Very common                     | Gonorrhea                    | Leaves, Roots; Whole| [3, 44]      |
| 135     | *Sida cordifolia* L.                | Malvaceae                 | Kharentli; Bala;            | Shrubs      | Common, weed in waste lands     | Gonorrhea                    | Leaves; Roots; Seed;| [21,31,33,40,44,48]|             |
| 136     | *Sida rhombifolia* Linn             | Malvaceae                 | Bariara; Kharentli;         | Herbs       | Makhala                         | Gonorrhea                    | Whole plant;         | [4, 28]      |
| 137     | *Smilax zeylanica* L.               | Smilacaceae               | Ram-datvan, Climbers        | Damp valleys|                                | Leucohooma                   | Roots; Whole plant;  | [32, 38, 57] |
| 138     | *Solanum americanum* Mill.          | Solanaceae                | Kamuni                       | Herbs       | Common                          | Gonorrhea                    | Leaves, Roots;       | [21, 39]     |
| 139     | *Solanum incanum* L.                | Solanaceae                | Dorli                        | Shrubs      | Occasional                      | Gonorrhea                    | Roots; Flowers;      | [3, 39]      |
| 140     | *Solanum surattense* Burm. F.       | Solanaceae                | Sundaka                      | Herbs       |                                | Gonorrhea                    | Whole plant;         | [3, 48]      |
| 141     | *Soymida febrifuga* (Roxb.) Juss.   | Meliaceae                 | Soimi;                       | Tree        | Common                          | Leucohooma                   | Bark;                | [3, 99]      |
| 142     | *Spondias pinnata* (L. f.) Kurz     | Anacardiaceae             | Amra, Ktamba                 | Tree        | Koku                            | Leucohooma                   | Wood;                | [3, 32, 48] |
| 143     | *Streblus asper* Lour.              | Moraceae                  | Karsani, Dahia               | Tree        | Khatkali side                   | Syphilis                     | Leaves; Stem;        | [21, 28]     |
| 144     | *Syzygium cumini* (L.) Skeels       | Myrtaceae                 | Jambhul;                    | Tree        | Common                          | Leucohooma                   | Roots; Stem bark;    | [38]         |
| 145     | *Tamarindus indica* L.              | Lythraceae                | Chinch, Imli                 | Tree        | Occasional                      | Syphilis                     | Leaves;              | [3, 28]      |
| 146     | *Tectona grandis* L. f.             | Verbenaceae               | Sagwan                       | Tree        | Very common                     | Gonorrhea                    | Bark; Wood; Fruit;   | [3, 35]      |
| 147     | *Tephrosia purpurea* (L.) Pers.     | Leguminosae               | Avasa                        | Shrubs      | Around villages                  | Gonorrhea                    | Whole plant; Leaves;| [3, 31, 35] |
| 148     | *Terminalia arjuna* (Roxb.)         | Combretaceae              | Koha, Kahu                   | Tree        | Common                          | Leucohooma                   | Bark; Stem bark; Stem| [32, 33, 38, 45, 48, 57] |
| 149     | *Terminalia chebula* Retz.           | Combretaceae              | Karka, Harro                 | Tree        | Semadoh and Chaurakund areas    | Leucohooma                   | Fruits;             | [3, 32, 100] |

References:
Atre and Khedkar; EJMP, 31(14): 1-17, 2020; Article no.EJMP.60797
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|--------|-----------------------------------------|------------------|-------------|---------------------|----------------|----------------|---------|------------------|
| 150.   | *Tinospora cordifolia*                   | Menispermaceae   | Guduchi, Giloy | Herbs              | Occasional     | Leucorrhoea    | Stems;  | [3, 32]         |
|        |                                         |                  |             |                     |                | Gonorrhoea    | Whole plant; | [49]            |
| 151.   | *Trema orientalis (L.) Blume*            | Ulmaceae         | Ghatari     | Tree                | Belkund, Dhakna, | Gonorrhoea | Leaves;  | [3, 45]         |
|        |                                         |                  |             |                     |                |                | Bark;   |                  |
| 152.   | *Trianthema portulacastrum L.*           | Zygophyllaceae   | Kharpakhuti | Herbs               | In river beds  | Gonorrhoea    | Leaves;  | [3, 101]        |
|        |                                         |                  |             |                     |                |                |         |                  |
| 153.   | *Tribulus terrestris L.*                 | Zygophyllaceae   | Gokharu     | Herbs               | Dry lands      | Gonorrhoea    | Fruits;  | [3, 31]         |
|        |                                         |                  |             |                     |                |                |         |                  |
| 154.   | *Trichosanthes cucumerina L.*            | Zygophyllaceae   | -           | Climbers            | Chaurakund     | HIV / AIDS    | Aerial part; | [7, 40]        |
|        |                                         |                  |             |                     |                |                |         |                  |
| 155.   | *Triumfetta rhomboidea Jacq.*            | Tiliaceae        | Anduli      | Shrubs              | Common         | Gonorrhoea    | Leaves, Flower, Fruit; | [3, 49] |
|        |                                         |                  |             |                     |                |                |         |                  |
| 156.   | *Uraria picta (Jacq.)DC.*                | Lythraceae       | Bishnaparni | Shrubs              | Occasional     | Gonorrhoea    | Leaves;  | [3, 102]        |
|        |                                         |                  |             |                     |                |                |         |                  |
| 157.   | *Urena lobata L.*                        | Malvaceae        | Unga        | Shrubs              | Frequent       | Gonorrhoea    | Leaves;  | [3, 35]         |
|        |                                         |                  |             |                     |                |                | Roots;  |                  |
| 158.   | *Vallaris solanacea (Roth) Kuntze*       | Apocynaceae      | Ramsur      | Climbers            | -              | Syphilis      | Latex, Stem; | [21, 44]       |
|        |                                         |                  |             |                     |                |                |         |                  |
| 159.   | *Vanda tessellata (Roxb.)*               | Orchidaceae      | Banda, Aitkel | Orchid          | Fairly common | Syphilis      | Roots;  | [3, 103]        |
|        |                                         |                  |             |                     |                |                | Leaves; |                  |
| 160.   | *Ventilago denticulata Wild.*            | Rahmnnaceae      | Kharbel     | Climbers            | Stream and River | Syphilis | Root, Flowers, Bark; Whole plant; | [3, 44] |
|        |                                         |                  |             |                     |                |                |         |                  |
| 161.   | *Vernonia cinerea (L.) Less*             | Asteraceae       | Sahdevi     | Herbs               | Very common    | Leucorrhoea   | Whole plant; | [3, 32, 44, 48, 59] |
|        |                                         |                  |             |                     |                |                |         |                  |
| 162.   | *Viscum articulatum Burm. f.*           | Santalaceae      | Banda, Budu | Shrubs              | Bori and Koktu | HIV / AIDS    | Whole plant; | [3, 104]       |
|        |                                         |                  |             |                     |                |                |         |                  |
| 163.   | *Vitex negundo L.*                       | Verbenaceae      | Nirgudi     | Shrubs              | Abundent       | Gonorrhoea    | Roots;  | [3, 35]         |
|        |                                         |                  |             |                     |                |                | Fruits; |                  |
|        |                                         |                  |             |                     |                | Leucorrhoea   |         |                  |
| 164.   | *Withania somnifera (L.) Dunal*          | Solanaceae       | Ashwagandha | Shrubs              | Semadoh        | Leucorrhoea   | Roots;  | [21, 48]        |
|        |                                         |                  |             |                     |                |                |         |                  |
| 165.   | *Woodfordia fruticosa (L.) Kurz*         | Lythraceae       | Dhi, Khinni | Shrubs              | Frequent       | Leucorrhoea   | Flowers; | [3, 32, 48]     |
|        |                                         |                  |             |                     |                |                |         |                  |
| 166.   | *Xanthium strumarium L.*                 | Asteraceae       | Gokharu     | Herbs               | Very common    | Leucorrhoea   | Flowers, Fruits; Whole plant; | [3, 38]|
|        |                                         |                  |             |                     |                |                |         |                  |
| 167.   | *Ziziphus mauritiana Lam.*              | Rahmnnaceae      | Bor, Ber    | Tree                | Village sites  | Leucorrhoea   | Seeds;  | [3, 32]         |
|        |                                         |                  |             |                     |                |                |         |                  |

LN – Local Name, Ha - Habit, FA - Floristic Allocation & PU – Part Used.
4. CONCLUSION
This literature review reveals that herbal remedies used for STI from the Melghat region of Maharashtra, India has intended to document the folk, indigenous practices and serve as scientific baseline information for researchers engaged in herbal drug discovery and development. All the plants reviewed exhibited potent activity confirming their various traditional uses and their ability to treat prevalent diseases. Therefore, it is the need of the subject to study these plants for further details, by isolating active compounds which can be processed into new and potent medicines and the need to study their mechanisms of action.

CONSENT
It is not applicable.

ETHICAL APPROVAL
It is not applicable.

COMPETING INTERESTS
Authors have declared that no competing interests exist.

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