Indian Journal of Traditional Knowledge
Vol 22(1), January 2023, pp 167-181
DOI: 10.56042/ijtk.v22i1.33335

Traditional phytoremedies for the treatment of vitiligo in Udhampur, J&K, India

Kewal Kumar[a], R K Manhas[b,*,!], Suraya P Singh[c,$] & Harpreet Bhatia[d,#]

[a]Department of Botany, Govt. Degree College for Women, Udhampur – 182101, J&K, India

[b]Department of Botany, Govt. Degree College, Basohli – 184201, J&K, India

[c]Department of Zoology, Govt. Degree College, Reasi – 182311, J&K, India

[d]Department of Botany, University of Jammu, Jammu – 180006, J&K, India

E-mail: [*,!]manhasrk@gmail.com; kewalkumar0@gmail.com; [$]suraya9@gmail.com; [#]harpreetbhatia2@gmail.com

Received 03 April 2020; revised 11 March 2023; accepted 13 March 2023

The present study was conducted in Udhampur district of J&K, India to document the traditional knowledge regarding the treatment of vitiligo. Information was collected through questionnaires and interviews from 83 informants. Use–value (UV) and disease consensus index (DCI) were calculated to assess plant knowledge and the level of agreement for a remedy, respectively. A total of 65 plants from 42 families and 61 genera were reported by the informants. The most number of plants used for curing vitiligo belonged to families Asteraceae, Rutaceae, Fabaceae and Lamiaceae. Invariably, all these families are rich source of psoralen used in photochemotherapy of skin disorders. The most used life–form were herbs (49.2%) and trees (36.9%) easily accessible to the patient from the nearby wild (58.5%). The prominently used (high DCI) plants for curing vitiligo were *Psoralea corylifolia* L., *Phyllanthus emblica* L., *Ficus carica* L., and *Acacia catechu* (L.f.) Willd. As psoralen is the main component present in most of these species, appropriate studies may further be carried out to verify the presence of psoralen and other phytochemicals present in other species used for curing vitiligo.

Keywords: Disease consensus factor, Phytoremedies, Psoralen, Use–value, Vitiligo

IPC Code: Int Cl.[23]: A61K 36/00

Skin is an external reflection of how a body is functioning internally and an important interface in the form of sense of well being and self confidence. Vitiligo is a chronic, idiopathic, acquired pigmentary disorder of skin resultant of autoimmunity[1,2], cytotoxicity[2], neural[2,6], genetic[2,4], triggering[2] and regular intake of unusual food combinations, stress, and sudden change in lifestyle[3]. It is characterized by de–pigmented patches in skin and mucous affecting about 1–4% of the world population, and acquired mostly before the age of 20 years[5].

Vitiligo is not a contagious or life threatening skin disorder but it can be life changing. Vitiligo is often confused with leprosy that also results in loss of pigment, and thus further stigmatizing patients[6]. Majority of vitiligo patients go through great psychological, emotional, and social repercussions[7] and anxiety, depression, aggravation, and embarrassment when they meet unfamiliar persons and disturbances are well-known in personal relations or starting a new sexual relationship[8].

Plants have been playing the most important role as a source of medicines especially the traditional medicines and have remained a pillar component in health care systems of resource poor societies in developing countries. According to the World Health Organization (WHO), medicinal herbs form the bases of conventional or native healthcare systems used by almost 80% of the World's population[9] probably due to inaccessibility for modern medical system, economic and cultural factors or herbal medicines are more acceptable in these communities from their cultural and spiritual point of views[10].

With its vast medicinal plant resources and status as the world's greatest producer, India is rightfully referred to as the "Botanical Garden of the World"[11]. In, India the native people exploit a variety of herbs and herbal products for preparing effective remedies to various illnesses. Local people have vast plant and folklore knowledge as a result of their continual interaction with woods, which they gain and pass on to future generations solely through word of mouth[12]. Regardless of the fact that use of more than 30 plants like babachee (*Psoralea corylifolia* L.), lime, lemon,

*Corresponding author

fig and cloves, containing chemical compounds psoralins in the management of vitiligo or leucoderma by the Indians as early as to 1400 B.C.[13], a very few studies have been conducted in India on traditional phytoremedies for vitiligo[14-17]. Jammu & Kashmir (UT), representing northern top of India, supports a rich and unique floristic diversity including a rich repository of medicinal plants and the traditional knowledge associated with these plants[18-20].

The modern day medicine and medical amenities have not reached the people living in the far flung areas of the World. The local inhabitants of these remote regions often acquired unique traditional knowledge about locally available plant resources through hit and trial methods and subsequent experience thereof. This traditional knowledge is dwindling rapidly because, in most cases, being passed on orally from one generation to another[18,20]. Since, plants are source for numerous novel drug compounds, documentation of traditional medicinal herbs can help in the discovery of important drugs in future. Keeping in consideration all these facts, the present investigation was conducted in the Udhampur district to explore the traditional phytoremedies used for curing vitiligo. This is the first ever study in J&K state for the documentation of traditional phytoremedies regarding vitiligo.

Material and Methods

Study area and local people's ethnographic background

District Udhampur is located between 32° 34´ and 39° 30´ N latitude and 74° 16´ and 75° 38´ E longitude in Jammu division of J&K (UT) and has an overall 2380 km^2 area. The district is located 66 Km from Jammu on the Jammu Srinagar national route in the south–eastern section of J&K, at a height ranging from 600 to 2900 m amsl[18]. The temperature ranges from 1 to 42 °C, with an average rainfall of 155.1 cm[18]. The months of July to September, as well as December to February, get the most rainfall. During the winter, 25% of the district's higher elevations are covered in snow. However, there are just a few inhabited sites above 11000 ft that endure snowfall and bitter cold[18].

Data collection

For the collection of information on phytoremedies for vitiligo, an extensive and systematic survey was conducted in different villages of district Udhampur from March, 2014 to Sept. 2016. The data was gathered through questionnaires and interviews, with the focus on the respondent's education, the duration of the problem, diagnosis, and treatment techniques, as well as the local name of the plant, plant portion used, growth form, preparation methods, and dose. During the flowering season, surveys were held more regularly in order to collect as much data as possible and to double-check the information provided by local informants during previous visits. The information's credibility was established by visiting each informant thrice. They were asked to escort us during the field visit for the identification and authentication of plant specimens. A total of 83 informants, between the age group of 25–85, were interviewed. The informants selected were elderly people, patients of the disease, local professional healers (*hakims* and *vaids*), herbalists, and any other knowledgeable person of the society. All the informants were briefed about the study and its objectives, and due prior informed consent (PIC) was obtained from the informants as per CBD guidelines.

The collected field data was organised and analysed to find the present ethnomedicinal use pattern of plants for vitiligo therapy in Udhampur district. The plant specimens were identified using relevant literature, which included a variety of regional and local floras[21]. Plant specimens were also identified with assistance from the herbaria of University of Jammu and IIIM, Jammu. The International Plant Names Index (http://www.ipni.org) was followed for the botanical nomenclature of species. The Herbarium of the Department of Botany, University of Jammu, Jammu, J&K, India received all of the plants described in the paper.

Data analysis

Use Value (UV)

The citation value for plants was calculated using UV. The formula used is as follows:

$$\mathrm{UV} = \frac{\Sigma U}{\mathrm{ns}}$$

Where, '*U*' is the total number of citations by the informants for a species divided by the total number of informants (ns). This method estimates the relative significance of each species based on its relative use amongst informants[22,23].

Disease Consensus Index (*DCI*)

It is a quantitative comparison used to evaluate plant knowledge and the degrees of agreement among

those suggesting the use of a plant as a disease cure. The following formula given by Andrade–Cetto *et al*.[22] was used to calculate this index using questions 1–14 (provided in the next paragraph).

$$DCI = \left(\frac{\Sigma V_{xi}}{cc} mV_x \right) Pm^{-0.1}$$

where 'x' is any species, 'Vxi' is the sum of individual values obtained for a species within the population and evaluates the knowledge and number of mentions for that species, 'mVx' is the average of individual values for a plant, and it assesses the plant's knowledge, and 'Cc' is the correlation coefficient, defined as the maximum number of informants who can refer to a plant and evaluates the number of mentions for that plant. $Pm^{-0.1}$ is a compensation factor that examines dispersion for a single plant, taking into account the way of preparation and parts employed. Using the DCI, one can assess plant knowledge, plant knowledge as a treatment (for a specific ailment), and how much people value the plant and its medicinal use[22,23].

Ethnobotanical questions specifically asked to calculate the index were: (1) plant name, (2) plant general description, (3) where they acquired the plant, (4) availability of the plant (rare/abundant), (5) plant part used, (6) preparation method, (7) form of consumption, (8) duration of plant use, (9) who recommended the plant, (10) relief symptoms after plant use, (11) whether they found the plant useful, (12) whether they recommend the use of the plant to others, (13) whether they are aware of plant's potential for harm, and (14) if they knew of a different usage for the plant (modified from Cruz and Andrade–Cetto[23]).

Results

During the course of present study, in total 83 informants were interviewed. Among this population, 82% informants were patients suffering from vitiligo and 18% informants were the traditional healers. A good percentage of informants (77.1%) were educated and managing vitiligo with the help of doctors and/or traditional healers whereas the other (uneducated) informants were consulting traditional healers as well as the religious people. The diagnosis of the vitiligo in most of the cases (94%) was made by the informant himself after the appearance of white spots. In case of other informants it was diagnosed by the family members or close friends.

Plants play vital role in treating various chronic diseases, in the present study also a good number of patients have recovered from vitiligo after the use of plants or plant products. Total 65 plants from 42 families and 61 genera were utilized by the informants to cure vitiligo in the present study (Table 1). Fabaceae, with 10 genera and 11 species, was the most represented plant family (Fig. 1). Other important contributors were from Asteraceae, Rutaceae and Lamiaceae. The most used life–form were herbs (49.2%) and trees (36.9%) (Fig. 2). These plants were generally recommended to the patients by the traditional healers or relatives. Most of the plants were easily accessible to the patient. Source of most of the plants used was the nearby wild (58.5%), cultivated (18.5%), wild/cultivated (16.9%) etc. (Fig. 3). Highly recommended plant *Psoralea corylifolia* L. was readily available on the shops or sparsely distributed in the wild.

White patches of vitiligo can be controlled both by external and oral medication. In present investigation, 64.5% of the total remedies were external and 35.5% were oral. The most utilized plant part (Fig. 4) was leaves (35.7%) closely followed by seeds (32.1%). Most of the informants (89%) were unaware of the harmful effects of the treatment.

The prominently used plants for curing vitiligo were *Psoralea corylifolia* L. (UV, 2.16; DCI, 0.87), *Phyllanthus emblica* L. (UV, 0.86; DCI, 0.70), *Ficus carica* L. (UV, 0.75; DCI, 0.68), *Acacia catechu* (L.f.) Willd. (UV, 0.72; DCI, 0.65), *Terminalia chebula* Retz. (UV, 0.59; DCI, 0.64), *Ficus religiosa* L. (UV, 0.58; DCI, 0.64), *Terminalia bellirica* (Gaertn.) Roxb. (UV, 0.54; DCI, 0.61), and *Cassia tora* L. (UV, 0.51; DCI, 0.61).

Discussion

There are many hypotheses and views about the beginning of vitiligo, which includes; autoimmunity, cytotoxicity, neural, genetic, triggering (sunburn, strain, pregnancy etc.) and regular intake of unusual food combination, regular trauma, and due to some routine problems[2]. A number of therapies, including corticosteroids, topical immune-modulators, photo (chemo) therapy and surgery, have proven to be partially successful but show various side effects[24]. On other hand, plants and plant products are affordable and thought to be safe[18] and they are rich source of active ingredients showing good results in curing skin problems[16,25]. In the present study, various plants and phytoremedies were suggested by the informants

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Psoralea corylifolia L.	Leguminosae	*Psoralea*	*Babchi*	JUH–15756	Herb	Seeds	10 g *Psoralea corylifolia* seeds, 10 g seeds of *Cassia tora* and 10 g bark of *Melia azedarach* are powdered and made into a paste in rose water (*Rosa damascena*) which is applied on white patches twice a day with sun exposure (15). 10 to 15 seeds are taken orally with water daily for 6 months (45). 10 g powdered seeds of *Psoralea corylifolia*, bark of *Acacia catechu*, and powdered seeds of *Phyllanthus emblica* are combined in 10 g of water and taken twice daily after meals for 6 months (12). 3 fruits of *Ficus carica*, 10 g powdered seeds of *Psoralea corylifolia*, 10 g powdered seeds of *Phyllanthus emblica*, and 10 g powdered bark of *Acacia catechu* is kept in 500 mL of water for overnight. Boil it in the morning till water left only 250 mL. Filter it and allow cooling. After it has cooled, add 10ml honey and take it twice a day for three months (14). 50 g seeds each of *Tamarindus indica* and *Psoralea corylifolia* are soaked for overnight and next morning grinded into a paste which is then applied on white patches with sun exposure of 10–20 min (17). 50 mL seed oil of *Celastrus paniculatus* is mixed with 50 mL *Psoralea corylifolia* oil and is applied on vitiligo affected areas twice a day for three months with sun exposure of 10 to 15 min (22). 50 g each of powdered seeds of *Cassia occidentalis*, *Psoralea corylifolia*, powdered fruits of *Ficus carica,* and powdered bark of *Ficus religiosa* are mixed together. A portion of this powder is mixed with water and applied to white spots on a daily basis. 6 g of this powder can also be taken orally daily for 3 months (21). Leaf juice of *Ageratum conyzoides* is mixed with powdered seeds of *Psoralea corylifolia* and is applied on white patches twice a day for 3 months (2). Powdered seeds of *Psoralea corylifolia* are combined with coconut oil and applied to the afflicted area twice a day with 5 to 15 min of sun exposure (6).	179	2.16	0.87

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur — (Contd.)

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Phyllanthus emblica L.	Phyllanthaceae	Emblic myrobalan	*Aamla*	JUH–14517	Tree	Seed	Equal quantity of seed powder of *Phyllanthus emblica*, *Terminalia chebula* and *Terminalia bellirica* (Locally called *Triphala*) is mixed with honey and made into candies of 3 g. For 5–6 months, one candy is eaten twice a day with water (8). 10 g each of powdered seeds of *Psoralea corylifolia*, bark of *Acacia catechu* and powdered seeds of *Phyllanthus emblica* are made into candy of 10 g in water is taken in the morning and evening after meals for 6 months (12). 3 fruits of *Ficus carica*, 10 g powdered seeds of *Psoralea corylifolia*, 10 g powdered seeds of *Phyllanthus emblica*, and 10 g powdered bark of *Acacia catechu* is kept in 500 mL of water for overnight. Boil it in the morning till water left only 250 mL. Filter it and allow cooling. After it has cooled, add 10 mL honey and take it twice a day for three months (14). Equal parts of seeds of *Cassia tora*, *Triphala* powder (*Phyllanthus emblica, Terminalia chebula* and *Terminalia bellirica*), powdered bark of *Acacia catechu* mixed together, and half spoon is taken orally with *Ocimum tenuiflorum* leaf juice twice a day for 3 months (27). 20 g seeds of *Cicer arietinum* soaked in water for overnight is taken along with 10 g of *Triphala* powder (*Terminalia chebula, Terminalia bellirica, Phyllanthus emblica*) for 2–3 months (10).	59	0.86	0.70
Ficus carica L.	Moraceae	Common fig	*Fakora*	JUH– 14892	Tree	Fruits, Leaves	Leaf juice is applied on skin. Eating fruits of the plants also helps in reduction of vitiligo (9). 3 fruits of *Ficus carica*, 10 g powdered seeds of *Psoralea corylifolia*, 10 g powdered seeds of *Phyllanthus emblica*, 10 g powdered bark of *Acacia catechu* are kept in 500 mL of water for overnight. Boil it in the morning till water left only 250 mL. Filter it and allow cooling. After it has cooled, add 10 mL honey and take it twice a day for three months (14). 50 g each of powdered seeds of *Cassia occidentalis*, *Psoralea corylifolia*, powdered fruits of *Ficus carica,* and powdered bark of *Ficus religiosa* are mixed together. A part of this powder is made into paste with water and is applied on white patches daily. 6 g of this powder can also be taken orally daily for 3 months (21). 20 g powdered seeds of coriander, 60 g powdered bark of *Ficus carica*, 40 g powdered plant of *Plumbago zeylanica* and 20 g powdered seeds of *Terminalia chebula* are mixed with cow's urine and made into small candies of 5 g each. For 50 days, each candy is eaten orally twice a day with water (18).	62	0.75	0.68

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Acacia catechu (L.f.) Willd.	Leguminosae	Cutch	*Katha, khair*	JUH– 14552	Tree	Bark	Decoction of the bark is given twice a day to stop the spread of vitiligo (7). 10 g each of powdered seeds of *Psoralea corylifolia*, bark of *Acacia catechu* and powdered seeds of *Phyllanthus emblica* are made into candy of 10 g in water is taken twice a day after meals for 6 months (12). Three fruits of *Ficus carica*, 10 g powdered seeds of *Psoralea corylifolia*, 10 g powdered seeds of *Phyllanthus emblica*, 10 g powdered bark of *Acacia catechu* are kept in 500 mL of water for overnight. Boil it in the morning till water left only 250 mL. Filter it and allow cooling. After cooling add 10 mL of honey and taken it orally twice a day for 3 months (14). Equal parts of seeds of *Cassia tora*, *Triphala* powder (*Phyllanthus emblica, Terminalia chebula* and *Terminalia bellirica*), powdered bark of *Acacia catechu* mixed together, and half spoon is taken orally with *Ocimum tenuiflorum* leaf juice twice a day for 3 months (27).	60	0.72	0.65
Terminalia chebula Retz.	Combretaceae	black– or chebulic myrobalan	*Harad*	JUH– 15757	Tree	Seeds	Dried seed of *Terminalia chebula* are rubbed in Garlic juice and the paste is applied on white patches twice a day (13). 20 g seeds of *Cicer arietinum* soaked in water for overnight is taken along with 10 g of Triphala powder (*Terminalia chebula*, *Terminalia bellirica*, *Phyllanthus emblica*) for 2–3 months (10). 20 g powdered seeds of coriander, 60 g powdered bark of *Ficus carica*, 40 g powdered plant of *Plumbago zeylanica* and 20 g powderd seeds of *Terminalia chebula* are mixed with cow's urine and made into small candies of 5 g each. Each candy is taken orally twice a day with water for 50 days (18). Equal quantity of seed powder of *Phyllanthus emblica*, *Terminalia chebula* and *Terminalia bellirica* is mixed with honey and made into candies of 3 g. For 5–6 months, one candy is eaten twice a day with water (8).	49	0.59	0.64
Ficus religiosa L.	Moraceae	Sacred fig	*Peepal*	JUH–14559	Tree	Latex	White cotton cloth dipped in honey and then mixed with latex of *Ficus religiosa*. It is dried in shade and then burned to ashes. The ash mixed with vinegar and the paste so formed is applied on white patches (10). 50 g each of powdered seeds of *Cassia occidentalis*, *Psoralea corylifolia*, and powdered fruits of *Ficus carica* and powdered bark of *Ficus religiosa* are mixed together. A part of this powder is made into paste with water and is applied on white patches daily. 6 g of this powder can also by taking orally daily for 3 months (21). 10 g powderd leaves of *Bacopa monnieri*, and ash of leaves of *Ficus religiosa*, Garlic cloves, powderd plant of *Plumbago zeylanica* and rock salt (mineral halite) are mixed with cow's urine and applied on white patches twice a day with sun exposure of 10 to 15 min (17).	48	0.58	0.64

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	Beleric or bastard myrobalan	*Behda*	JUH– 15758	Tree	Seed	Equal quantity of seed powder of *Phyllanthus emblica*, *Terminalia chebula* and *Terminalia bellirica* is mixed with honey and made into candies of 3 g. For 5–6 months, one candy is eaten twice a day with water (8). Equal parts of seeds of *Cassia tora*, *Triphala* powder and powdered bark of *Acacia catechu* mixed together and half spoon is taken orally with *Ocimum tenuiflorum* leaf juice twice a day for 3 months (27). 20 g seeds of *Cicer arietinum* soaked in water for overnight is taken along with 10 g of *Triphala* powder (*Terminalia chebula, Terminalia bellirica, Phyllanthus emblica*) for 2–3 months (10).	45	0.54	0.61
Cassia tora L.	Leguminosae	Ring worm plant	*Loki edma*	JUH–14497	Herb	Seeds	Equal parts of seeds of *Cassia tora*, *Triphala* powder, powdered bark of *Acacia catechu* mixed together and half spoon is taken orally with *Ocimum tenuiflorum* leaf juice twice a day for 3 months (27). 10 g *Psoralea corylifolia* seeds, 10 g seeds of *Cassia tora* and 10 g bark of *Melia azedarach* are powdered and made into a paste in rose water (*Rosa damascena*) which is applied on white patche twice a day with sun exposure (15).	42	0.51	0.61
Ipomoea fistulosa Mart. ex Choisy	Convolvulaceae	Bush morning glory	*Valeti aak*	JUH– 14004	Shrub	Latex	Milky latex is applied on white patches twice a day (41).	41	0.49	0.60
Celastrus paniculatus Willd.	Celastraceae	Black Oil Plant	*Maalkadni*	JUH– 15759	Climbing Shrub	Seeds	50 mL seed oil of *Celastrus paniculatus* is mixed with 50 mL *Psoralea corylifolia* oil and is applied on vitiligo affected areas twice a day for three months with sun exposure of 10 to 15 min (22). Whole plant of *Achyranthes aspera* is burnt till it reduced to ashes. This ash is dissolved in water, strained and again heated to evaporate the water forming *Kshar*. 20 g of this *Kshar* is mixed with 50 mL seed oil of *Celastrus paniculatus* and are then boiled in 200 mL water. The paste so formed is applied on vitiligo affected parts (16).	38	0.46	0.54
Plumbago zeylanica L.	Plumbaginaceae	Ceylon leadwort	*Chitta chitra*	JUH–14572	Herb	Root	Powdered root is mixed with mustard oil and the paste so formed is applied on vitiligo affected areas thrice a day (2). 20 g powdered seeds of coriander, 60 g powdered bark of *Ficus carica*, 40 g powdered plant of *Plumbago zeylanica* and 20 g powdered seeds of *Terminalia chebula* are mixed with cow's urine and made into small candies of 5 g each. For 50 days, one candy is eaten twice a day with water (18). 10 g powdered leaves of *Bacopa monnieri*, and ash of leaves of *Ficus religiosa*, Garlic cloves, powdered plant of *Plumbago zeylanica* and rock salt (mineral halite) are mixed with cow's urine and applied on white patches twice a day with sun exposure of 10 to 15 min (17).	37	0.45	0.53

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Ocimum tenuiflorum L.	Lamiaceae	Holy basil	*Tulsi*	JUH–14537	Herb	Whole plant, Leaves	Whole plant is taken and boiled in 500ml of water and 500 g of Seasame oil. When the water evaporates, the oil is collected in a bottle and applied on white patches twice a day (3). Leaves are eaten on empty stomach daily for reducing the spread of disease (3). 50 g leaves of *Picrorhiza kurroa*, 50 g leaves of *Ocimum tenuiflorum* and 50 g ferrous sulphate are crushed in water to form of paste during night and the paste is applied on vitiligo affected parts on next morning (4). Equal parts of seeds of *Cassia tora*, *Triphala* powder, powdered bark of *Acacia catechu* mixed together and half spoon is taken orally with leaves of *Ocimum tenuiflorum* twice a day for three months (27).	37	0.44	0.52
Zingiber officinale Roscoe	Zingiberaceae	Ginger	*Adrak*	JUH–15754	Herb	Leaves	Leaf paste is applied on white patches (23).	23	0.28	0.52
Cassia occidentalis L.	Leguminosae	Coffee Cassia	*Baddi e dman*	JUH– 13997	Under shrub	Seeds	50 g each of powdered seeds of *Cassia occidentalis*, *Psoralea corylifolia*, powdered fruits of *Ficus carica*, and powdered bark of *Ficus religiosa* are mixed together. A part of this powder is mixed with water and is applied on white patches daily. 6 g of this powder can also be taken orally daily for 3 months (21).	21	0.25	0.43
Melia azedarach L.	Meliaceae	Chinaberry	*Drenkh*	JUH–14549	Tree	Leaves	Leaves of *Melia azedarach* and *Punica granatum* are made into paste which is applied on the white patches twice a day (6). 10 g *Psoralea corylifolia* seeds, 10 g seeds of *Cassia tora* and 10 g bark of *Melia azedarach* are powdered and made into a paste in rose water (*Rosa damascena*) which is applied on white patches twice a day with sun exposure (15).	21	0.25	0.42
Allium sativum L.	Amaryllidaceae.	Garlic	*Thom*	JUH–14447	Herb	Clove juice	Dried seed of *Terminalia chebula* are rubbed in Garlic juice and this paste is employed on white patches twice a day (3). 10 g powdered leaves of *Bacopa monnieri*, and ash of leaves of *Ficus religiosa*, Garlic cloves, powdered plant of *Plumbago zeylanica* and rock salt (mineral halite) are mixed with cow's urine and applied on white patches twice a day with sun exposure of 10 to 15 min (17).	20	0.24	0.41
Coriandrum sativum L.	Apiaceae	Coriander	*Dhania*	JUH–14458	Herb	Seeds	20 g powdered seeds of coriander, 60 g powdered bark of *Ficus carica*, 40 g powdered plant of *Plumbago zeylanica* and 20 g powderd seeds of *Terminalia chebula* are mixed with cow's urine and made into small candies of 5 g each. Each candy is taken orally twice a day with water for 50 days (18).	18	0.22	0.41
Azadirachta indica A.Juss.	Meliaceae	Indian Lilac	*Neem*	JUH–14548	Tree	Leaves, flower and fruit	Leaves, flowers and fruits are dried and made into powder. 2 g of powder is taken orally every day empty stomach in the morning or 40 days. Every morning, a decoction of the leaves is taken (14). 50 g leaves each of *Psidium guajava*, *Mangifera indica* and *Azadirachta indica* are boiled in 1000 mL of water till 250 mL of extract left. The extract filtered, filled in bottle and is applied on vitiligo affected areas twice a day (4).	18	0.22	0.37

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Ocimum basilicum L.	Lamiaceae	Sweet basil	*Ram tulsi*	JUH–14536	Herb	Leaves	Leaf paste is applied on white patches (18)	18	0.22	0.37
Cocos nucifera L.	Arecaceae	Coconut	*Nariyal, Khopa*	–	Tree	Seed endosperm	Massage of affected areas with coconut oil helps in reduction of white patches (12). Powdered seeds of *Psoralea corylifolia* are combined with coconut oil and applied to the affected area twice a day with 5 to 15 min of sun exposure (6).	18	0.22	0.34
Bacopa monnieri (L.) Wettst.	Plantaginaceae	Water hyssop	*Jal neem, Brahmi booti*	JUH– 15760	Herb	Leaves	10 g powdered leaves of *Bacopa monnieri*, and ash of leaves of *Ficus religiosa*, Garlic cloves, powdered plant of *Plumbago zeylanica* and rock salt (mineral halite) are mixed with cow's urine and applied on white patches twice a day with sun exposure of 10 to 15 min (17).	17	0.20	0.33
Tamarindus indica L.	Leguminosae	Tamarind	*Imblee*	JUH–14498	Tree	Seeds	50g seeds each of *Tamarindus indica* and *Psoralea corylifolia* are soaked for overnight and next morning grinded into a paste which is then applied on white patches with sun exposure of 10–20 min (17).	17	0.20	0.32
Achyranthes aspera L.	Amaranthaceae	Prickly Chaff Flower	*Puthkanda*	JUH–14449	Herb	Whole plant	Whole plant is burnt till it is reduced to ashes. This ash is dissolved in water, strained and again heated to evaporate the water. Dehydrated salty solid obtained by this process is known as *Kshar/Ksara*. 20 g of this *Kshar* is mixed with 50 mL seed oil of *Celastrus paniculatus* and are then boiled in 200 mL water. The paste so formed is applied on vitiligo affected parts (16).	16	0.20	0.29
Sesamum indicum L.	Pedaliaceae	Sesame	*Til*	JUH–14571	Herb	Seeds	Seed oil is mixed with basil oil and is applied on white patches (13).	13	0.16	0.23
Cicer arietinum L.	Leguminosae	Chickpea	*Kaale sholey*	JUH–14521	Herb	Seeds	Seed flour locally called '*Besan*' is made in the form of Chapattis which is used with cow butter twice a day (2). 20 g seeds of *Cicer arietinum* soaked in water for overnight are taken along with 10 g of *Triphala* powder for 2–3 months (10).	12	0.14	0.19
Piper nigrum L.	Piperaceae	Black pepper	*Kaale maarch*	–	Herb	Seeds	Seeds are powdered and made into paste in water and applied on vitiligo-affected areas thrice a day (11).	11	0.13	0.16
Vitex negundo L.	Lamiaceae	Chinese chastetree	*Vanna*	JUH–15751	Shrub	Leaves	Leaf paste is applied on white patches. 500 g leaves boiled in 1000 mL water and 200 mL mustard oil. When the whole water evaporates, the oil so left is applied on white patches (11).	11	0.13	0.16
Aegle marmelos (L.) Corrêa	Rutaceae	Golden apple	*Bhael*	JUH–14594	Tree	Fruits, Leaves	Fruit juice is taken twice a day to reduce the spread of white patches. Decoction of leaves is also taken empty stomach daily for 3 months (11).	11	0.13	0.14
Punica granatum L.	Lythraceae	Pomegranate	*Naar*	JUH–14542	Small tree	Leaves	Leaves dried in shade are powdered and sieved through a cotton cloth. A spoonful of this powder is taken orally twice a day after meals with milk or water for 5 to 6 months (3). A paste of leaves of *Punica granatum* and *Melia azedarach* is applied on the white patches twice a day (6).	9	0.11	0.08
Chenopodium album L.	Amaranthaceae	White goosefoot	*Baathu, Kunah*	JUH–14504	Herb	Leaves	Juice of young leaves is taken twice a day. Also be taken as vegetable to reduce the spread of disease (8).	8	0.10	0.07
Albizia lebbeck (L.) Benth.	Leguminosae	Lebbek tree	*Sarin*	JUH–14553	Tree	Bark	Powdered stem bark is made into paste in mustard oil and is applied on vitiligo affected parts (7).	7	0.08	0.06

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑ U	UV	DCI
Eclipta prostrata (L.) L.	Compositae	False daisy	*Bhringraj*	JUH–14475	Herb	Leaves	For three months, leaf extract is administered twice-daily to vitiligo-affected areas. Decoction of leaves is utilised as a tonic (7)	7	0.08	0.06
Hypericum perforatum L.	Hypericaceae	St John's wort	*Basantalu*	JUH–14778	Herb	Leave, flower	Decoction of leaves and flower is given thrice a day after meals for 3 months. Leaf paste can also be applied on white patches (6).	6	0.07	0.06
Euphorbia royleana Boiss.	Euphorbiaceae	Royle's Spurge	*Sul, thor*	JUH–14515	Shrub	Whole plant	The entire plant is deep fried in mustard oil and used to treat vitiligo (6).	6	0.07	0.06
Daucus carota L.	Lamiaceae	Wild carrot	*Gajar*	JUH–14460	Herb	Root	To inhibit the spread of vitiligo, root juice is taken twice a day for three months (5).	5	0.06	0.05
Cucurbita maxima Duchesne	Cucurbitaceae	Pumpkin	*Kaddu*	JUH– 14845	Climber	Flower	Paste or juice of flowers is applied on white patches thrice a day for 2 or 3 months (5).	5	0.06	0.05
Calotropis procera (Aiton) Dryand.	Apocynaceae	Sodom apple	*Desi aak*	JUH–14468	Herb	Root	5 g each of root powder of *Calotropis procera*, leaf powder of *Picrorhiza kurroa*, turmeric (*Curcuma longa*) and sulphur powder are mixed with cow's urine and made into paste which is applied on vitiligo affected areas for 2–3 weeks (5).	5	0.06	0.05
Raphanus sativus L.	Brassicaceae	Garden radish	*Muli*	JUH–14491	Herb	Seeds	Seeds soaked in water overnight are applied on white patches in the form of paste twice a day for 3 months (5).	5	0.06	0.04
Curcuma longa L.	Zingiberaceae	Turmeric	*Haldar*	JUH–15753	Herb	Rhizo–me	The paste is made by mixing powdered rhizome with mustard oil and applying it on white spots (4).	4	0.05	0.04
Psidium guajava L.	Myrtaceae	Guava	*Amrood*	JUH–14563	Tree	Leaves	50 g leaves each of *Psidium guajava*, *Mangifera indica* and *Azadirachta indica* are boiled in 1000ml of water till 250 mL of extract left. The extract filtered, filled in bottle and is applied on vitiligo affected areas twice a day (4).	4	0.05	0.04
Abelmoschus esculentus (L.) Moench	Malvaceae	Lady finger	*Pindi*	JUH– 15761	Herb	Seeds	Seeds soaked in water overnight are applied on white patches in the form of paste twice a day for 3 months (4).	4	0.05	0.04
Mangifera indica L.	Anacardiaceae	Mango	*Aamb*	JUH–14455	Tree	Leaves	50 g leaves each of *Psidium guajava*, *Mangifera indica* and *Azadirachta indica* are boiled in 1000ml of water till 250 mL of extract left. The extract filtered, filled in bottle and is applied on vitiligo affected areas twice a day (4).	4	0.05	0.04
Juglans regia L.	Juglandaceae	English Walnut	*Akhrot*	JUH–14531	Tree	Seed kernel	Continuous consumption of one seed kernel of *Juglans regia* daily for 6 months helps in reduction of vitiligo (4).	4	0.05	0.04
Musa paradisiaca L.	Musaceae	Banana	*Kela*	JUH– 14567	Tree	Leaves	Leaves are dried in shade and then burned to form ash. The ash is then combined with cow butter to make a paste that is administered twice daily to white spots for 3 to 4 months (3).	3	0.04	0.04
Murraya koenigii (L.) Spreng.	Rutaceae	The curry tree	*Kadi patta*	JUH– 15761	Tree	Leaves	Decoction of leaves is taken twice a day one hour before or after meals for 5 to 6 months (3).	3	0.04	0.03
Fumaria indica (Hausskn.) Pugsley	Papaveraceae	Indian Fumitory	*Pitpaapda*	JUH–14528	Herb	Aerial parts	Aerial parts are crushed and the paste is applied on white patches twice a day (3).	3	0.04	0.03
Boerhavia diffusa L.	Nyctaginaceae	Hogweed	*Itt sitt*	JUH–14565	Herb	Leaves	Leaf juice is mixed with powdered leaves of *Cinnamomum tamala* and administered on vitiligo spots (3).	3	0.04	0.03

(Contd.)

Table 1 — Use value (UV) and disease consensus index (DCI) of plants used to cure vitiligo by the local populace of Udhampur

Botanical name	Family	Common name	Vernacular name	Voucher No.	Habit	Part used	Ethnomedicinal methodology (values in parenthesis are use–citations)	∑U	UV	DCI
Cinnamomum tamala (Buch.–Ham.) T. Nees & Eberm.	Lauraceae	Indian Bay Leaf	*Tej patta*	–	Herb	Leaves	Powdered leaves are mixed with *Boerhavia diffusa* leaf juice and the paste so formed is applied on white patches (3).	3	0.04	0.02
Medicago sativa L.	Leguminosae	Alfalfa	*Sariri*	JUH– 15762	Herb	Leaves	100 g Leaf juice mixed with 100 g *Cucumis sativus* juice, and consumed twice a day for 5 months (3).	3	0.04	0.02
Rubia cordifolia L.	Rubiaceae	Common madder	*Baddi macheeth*	JUH– 14777	Herb	Leaves	Leaf juice is used as ointment for vitiligo affected parts (3).	3	0.04	0.02
Abrus precatorius L.	Leguminosae	Jequirity	*Ratti*	JUH–14519	Climber	Leaves	Juice from macerated leaves is used as an ointment for treating white patches (3).	3	0.04	0.02
Solanum americanum Mill.	Solanaceae	Garden Nightshade	*Kaya kaathi*	JUH–15743	Herb	Leaves & whole plant	Leaves are used in the form of vegetable without adding salt and spices. Only half spoonful of turmeric powder is added to the vegetable. Whole plant is used as poultice in vitiligo. Decoction of the plant is also used as a wash for vitiligo affected areas (2).	2	0.02	0.01
Dalbergia sissoo DC.	Leguminosae	North Indian Rosewood	*Taali*	JUH–14522	Tree	Bark	Powered bark made into a paste in mustard oil is applied on white patches twice a day (2).	2	0.02	0.01
Picrorhiza kurroa Royle ex Benth.	Plantaginaceae	Hellebore	*Chitti Kod*	JUH– 15763	Herb	Leaves	50 g leaves *Picrorhiza kurroa*, 50 g leaves of *Ocimum tenuiflorum* and 50 g ferrous sulphate are crushed in water in the form of paste during night and the paste is applied on vitiligo affected parts on next morning (2).	2	0.02	0.01
Xanthium strumarium L.	Asteraceae	Common Cocklebur	*Jojra*	JUH–14482	Herb	Whole plant	Whole plant is crushed to form paste which is applied on white patches (2).	2	0.02	0.01
Vigna mungo (L.) Hepper	Leguminosae	Black gram	*Kaale maa*	JUH– 15764	Herb	Seeds	Powdered seeds are made into a paste in water and are applied on white patches (2).	2	0.02	0.01
Aloe vera (L.) Burm.f.	Asparagaceae	Indian Aloe	*Kuaad kandal*	JUH–14448	Herb	Leaves	Leaf gel is applied on white patches to stop the spread of disease (2).	2	0.02	0.01
Lawsonia inermis L.	Lythraceae	Henna	*Mendi*	JUH–14541	Tree	Leaves	Leaves are chewed and spitted out in case of lip vitiligo. Leaves crushed in the form of paste are also applied on white patches (2).	2	0.02	0.01
Tinospora cordifolia (Willd.) Miers	Menispermaceae	Heart–leaved moonseed	*Giloy*	JUH–14551	Climber	Stem	Stem juice is taken empty stomach daily (2).	2	0.02	0.01
Ageratum conyzoides (L.) L.	Compositae	Billy Goat Weed	*Neeli jadi*	JUH– 15765	Herb	Leaves	Leaf juice is mixed with powdered seeds of *Psoralea corylifolia* and the ointment formed is administered on white spots twice a day for 3 months (2).	2	0.02	0.01
Prunus amygdalus Stokes	Rosaceae	Almond	*Badam*	JUH– 15766	Tree	Seed	Seed oil is applied on white patches twice a day for 6 months (1).	1	0.01	0.002
Zanthoxylum armatum DC.	Rutaceae	Winged Prickly Ash	*Timbru*	JUH–14597	Tree	Seeds, Leaves	An ointment is made by mixing powdered seeds and leaves with water and administered twice-daily to vitiligo-affected areas (1).	1	0.01	0.002
Aristolochia littoralis Parodi syn *Aristolochia elegans* Mast.	Aristolochiaceae	Elegant Dutchman's Pipe	-	JUH– 15767	Climber	Root	Powdered root mixed with honey and water is taken twice a day for 2–3 months (1).	1	0.01	0.001
Alangium chinense (Lour.) Harms	Cornaceae	Chinese Alangium	*Gadkimu*	JUH– 15768	Tree	Bark, Leaves	Bark and leaf dipped in water overnight and the filtrate is taken in the morning daily (1).	1	0.01	0.001
Anacardium occidentale L.	Anacardiaceae	Cashew nut	*Kaaju*	–	Tree	Seed	Eating cashew nuts also reduces the spread of vitiligo (1).	1	0.01	0.001

for treating vitiligo which generally targeted cytotoxicity, neural, indigestion, blood purification, and genetic makeup of the patient naturally.

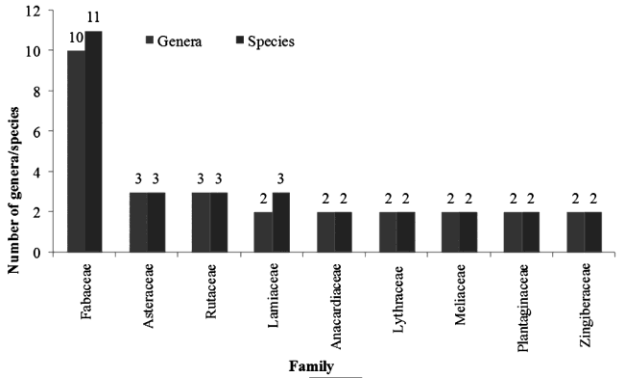

Fig. 1 — Number of genera and species in the most represented plant families

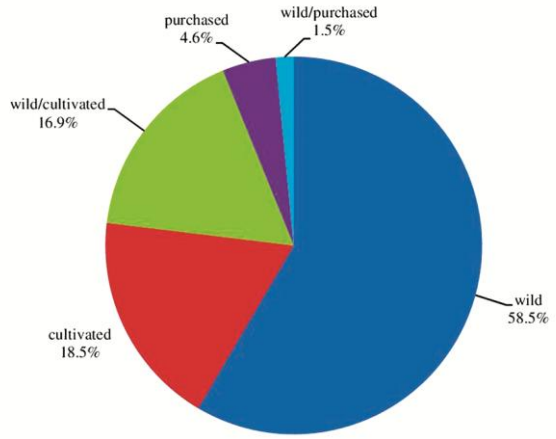

Fig. 2 — Percentage contribution of various life–forms of ethnomedicinal plants

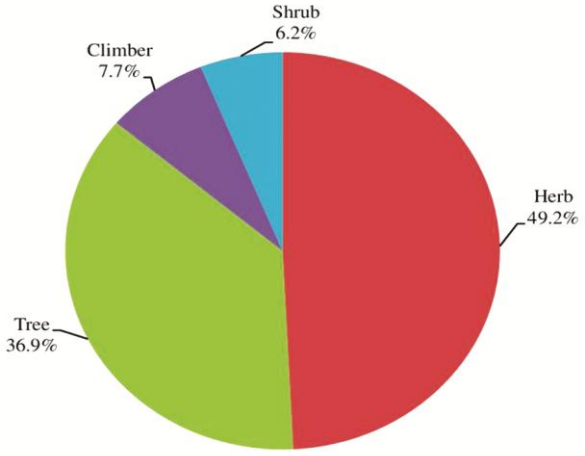

Fig. 3 — Percentage contribution of various sources of ethnomedicinal plants

In the present research, plant that emerged as most important remedy for curing vitiligo were mostly from families Asteraceae, Rutaceae, Fabaceae and Lamiaceae. Invariably, all these families are known to be rich source of a bioactive furanocoumarin compound called psoralen[15,26] and have been recommended for curing vitiligo[15,27]. Psoralens are known for their phototoxic and photosensitizing effects and have been used in photochemotherapy of skin disorders like psoriasis, vitiligo, and mycosis[28]. PUVA (Psoralen: Ultra violet–A) treatment is used in skin curing problems as it utilizes the high UV absorbance efficiency of psoralen. Psoralens are either taken orally or applied first to stimulate the skin, then long wavelength light (UV–A, 320–400 nm) is used to cure the skin problem. The mechanism of PUVA treatment is still unknown, but some theories include increasing the number of functional melanocytes or activating inactive melanocytes in the appendages and epidermis; inducing hypertrophy of melanocytes and increased arborization of their dendrites; supplementing the growth and conversion of melanosomes to melanin and enhancing the movement of melanosomes to keratinocytes; and stimulating tyrosinase activity; increasing the transfer of activated melanocytes from skin appendages; establishing a population of suppressor cells that suppresses the stimulation for melanocyte mortality during therapy[29]. Psoralen also intercalate into DNA, to synthesize mono– and di–adducts in the presence of UV light and therefore are used as remedy of vitiligo[30].

The plants which emerged as prominent herbal remedy for curing vitiligo in the current study were *Psoralea corylifolia, Phyllanthus emblica*, *Ficus carica*, *Acacia catechu*, *Terminalia chebula*, *Ficus religiosa*, *Terminalia bellirica*, and *Cassia tora*.

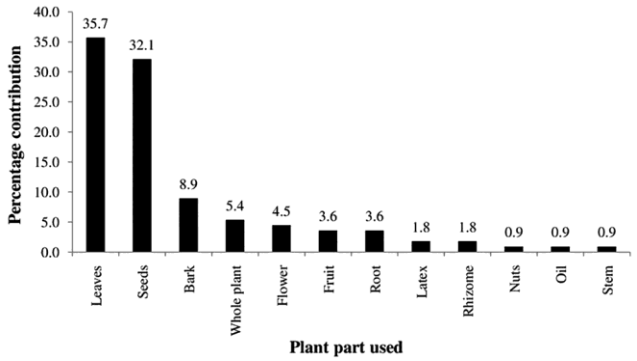

Fig. 4 — Contribution (%) of plant parts used for the treatment of vitiligo

Use of these plants to cure vitiligo has also been reported in *Ayurvedic* and Traditional Chinese Medicine[31] and some other studies[17,27,32-34].

Psoralea corylifolia came up as the most used plant against vitiligo in the present study. It formed an important ingredient of the about 12% of the herbal recipes used by the locals of Udhampur district for curing vitiligo. A number of studies[17,27,32.33] have also mentioned *Psoralea corylifolia* as an important phytomedicine for treating vitiligo. *Psoralea corylifolia* is taken as oral medicine as well as ointment. Topical application of *Psoralea corylifolia* seeds represses the expansion and delayed the beginning of papilloma formation[32]. This plant has yielded a number of chemical components, including flavonoids and coumarins (psoralens) that exhibit antioxidant[35], antiplatelet[36], estrogenic[37], immune–modulatory and antitumor properties[38], and anti inflammatory activities[39]. Psoralens present in *Psoralea corylifolia* increases the rate of formation of melanin and helps the skin to recuperate from depigmentation state[27]. The use of early morning sunlight on affected area is recommended because the sunlight has content of UV-rays and with *Psoralea corylifolia* leads to favourable environment for encouraging the growth of melanocyte, migration and stimulates proliferation[40] and also check the autoimmune activity. A number of spectrophometric and EPR studies showed that the pharmaceutical effects of *Psoralea corylifolia* were attributed in part to its ability to exhibit stable anti–oxidative and free–radical scavenging properties[33].

Phyllanthus emblica was a key ingredient in 10% of the herbal formulations indicated by the informants in this study. *Phyllanthus emblica* has also been mentioned by Colucci *et al.*[34] as a potential vitiligo phytoremedy. The vitamin C content of the species' fruits aids in immunological response[41]. Because it contains anti–oxidants like as ascorbic acid, flavonoids, and tannins, *Phyllanthus emblica* has the ability to address vitiligo ox–redox imbalances[34]. The effectiveness of vitiligo treatments can be enhanced by the use antioxidants as supplements. Oral treatment by supplementing *Phyllanthus emblica* fruit extracts as an antioxidant, carotenoids, and vitamin E, combined with typical topical healing and/or narrowband ultraviolet B (NBUVB) phototherapy, showed significant increases in regaining pigmentation in comparison to both topical and NBUVB treatments combined or alone. Lower intensity of serum inflammatory markers was noticed for the antioxidant healing group as well[34].

Another important plant that was reported by informants to have the ability to reverse the effect of vitiligo is *Ficus carica*. It was a major ingredient of nearly 12% of herbal formulations prepared by the locals for curing vitiligo. *Ficus carica* has also been described as a phytoremedy for vitiligo in a number of previous investigations[15]. Bergapten (5–methoxypsoralen) and psoralen are two photoactive furanocoumarins found in *Ficus carica* leaves[15,42]. Because T–lymphocyte content is always decreasing in vitiligo patients, immune–modulating medicines should be included in complicated therapy[42]. *Ficus carica* leaf extract has promising immune-stimulant effects[42], and comparatively higher levels of psoralens and hence can be effectively used in treating vitiligo[43].

According to *Ayurveda*, vitiligo is caused mainly due to *Pitta dosha* which results in to accumulation of toxins in innermost layers of skin and leads to vitiligo. Basic treatment of vitiligo includes (i) restoring imbalanced body energies, (ii) purifying blood, and (iii) administering the herbs for repigmentation. The *Ayurvedic* medicine mainly uses herbal drugs that are mineral–based and works as photosensitizers and blood purifiers. *Psoralea corylifolia, Phyllanthus emblica* and *Ficus carica* have photosensitizing properties[33,34,42]. Fruits, seeds, and leaves of these plants are used in various herbal formulations and are administrated topically as well as systemically in conjunction with three hours sun exposure. Plants used as blood purifiers in the current study include *Psoralea corylifolia* L., *Eclipta prostrate* L., *Curcuma longa* L., *Azadirachta indica* A. Juss., *Daucus carota* L., *Tinospora cardifolia* (Willd.) Miers, *Acacia catechu* (L.f.) Willd., and *Achyranthus aspera* L. Studies conducted by Chauhan[44] have also reported the blood purifier properties of these plants.

As per *Ayurveda* poor digestion is another reason for the cause of vitiligo. Poor digestion results in increase of toxins in the body which may trigger vitiligo. Therefore, reestablishing digestion is the crucial part of the *Ayurveda* treatment. In the present study, *triphala* was used in a number of preparations. *Triphala* is a blend of the dried fruits of *Phyllanthus emblica, Terminalia bellirica* and *Terminalia chebula* in equal proportions. Triphala is rich in antioxidants, and possess antibacterial, anti–viral, and anti–cancerous properties[45]. *Triphala* works by stimulating

the mucosa membrane of the gastric–intestinal tract, balancing, and improving digestion, and also removes toxins from the gastro-intestinal tract[45]. Due to immuno-stimulant and anti–oxidative properties of the active constituents of *triphala*, it is vital part of various formulations for treating vitiligo[45].

The recipes of phytoremedies in the present study generally involved more than one species. Local healers do this based on their personal experiences, and combining different plants has been demonstrated to improve the efficacy of herbal medicine by covering the various aspects or causes of vitiligo. According to Rao *et al*.[20], combining several plants improves the efficacy of medicine, and the 'bad effects' of one plant (if present) are 'neutralised' by the other.

Conclusions

After critical appraisal of the results, following three conclusions can be drawn; (i) a rich diversity of medicinal plants and knowledge is available with the village populace of Udhampur district, (ii) psoralens that are naturally found in the all main plants is the major component of the treatment, (iii) the local healers were treating vitiligo in the line to the *Ayurvedic* mode of treatment. According to traditional treatments, toxin deposition in the body due to malfunctioning of *pitta dosha* or indigestion may trigger vitiligo. The basic treatment of vitiligo includes restoration of imbalanced body energies, purifying blood, and administering the herbs for repigmentation. But the basic problems associated with the traditional treatments are the non–availability of written record regarding the recipe, its success/failure, and any side effect. Such type of ethnobotanical studies help in conserving this valuable knowledge and provide the benchmark information for the discovery of novel drugs for treating vitiligo in future.

Acknowledgements

The authors are thankful to the faculty of Department of Botany, University of Jammu, Jammu, for their support and valuable suggestions. We are also thankful to the staff members for their support during the course of study.

Conflict of Interest

The authors declare that they have no conflict of interest.

Author's Contributions

RKM was in charge of the study's design and editing of the final manuscript. KK and HB conducted field surveys and gathered data. The data was analysed by RKM, and the manuscript was written by RKM, KK, and SPS. The final manuscript has been read and approved by all of the authors.

References

1 Kemp E H, Waterman E A & Weetman A P, Autoimmune aspects of vitiligo, *Autoimmunity*, 34 (2001) 65-77.
2 Soni P, Patidar R, Soni V & Soni S, A Review on Traditional and Alternative Treatment for Skin Disease- Vitiligo, *Int J Pharm Biol Arch*, 1(3) (2010) 220-227.
3 Mozzanica N, Frigerio N, Cattaneo N, Negri N & Scaglione N T, Cell subpopulations in vitiligo: A chronobiologic study, *J Am Acad Dermatol*, 22 (2) (1990) 223-230.
4 Mohan L, Singh L, Kaur L, Pandey L, Mohan L & Niyogi L, Vitiligo: a genetic evaluation, *Indian J Dermatol*, 27 (3) (1982) 77-85.
5 Arican O & Kurutas E B, Oxidative stress in blood of patients with active localized vitiligo, *Acta Dermatoven APA*, 17 (2008) 12-16.
6 Porter J, Beuf A, Lerner A & Nordlwnd J, Response to cosmetic disfigurement: A study of patients with vitiligo, *Cutis*, 39 (1987) 493-494.
7 Nogueira L S, Zancanaro P C & Azambuja R D, Vitiligo and emotions, *Anais Brasileiros de Dermatol*, 84 (2009) 41-45.
8 Ramakrishna P & Rajni T, Psychiatric morbidity and quality of life in vitiligo patients, *Indian J Psychological Med*, 36 (3) (2014) 302-303.
9 WHO, Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines Manila, WHO Regional Office for the Western Pacific, 1993, p. 86.
10 Cunningham A B, African medicinal plants setting priorities at the interface between conservation and primary healthcare-(Paris, UNESCO, People and Plant Working Paper 1), 1993, p. 53.
11 Dubey N K, Kumar R & Tipathi P, Global promotion of herbal medicine: India's opportunity, *Curr Sci*, 86 (2004) 37-41.
12 Prasad S, Traditional healthcare practices among tribes: A study of Mandla district in Madhya Pradesh, *Indian J Tradit Know*, 21 (4) (2022) 820-827.
13 Van de Kerkhof P C M, Clinical features In: Text-book of psoriasis- 1st ed., edited by P D Meir & P C M Van de Kerkhof, (Churchill Livingstone, Edinburg), 1986, p. 13-39.
14 Singh U & Narain S, Traditional treatment of leucoderma by Kol tribes of Vindhyan region of Uttar Pradesh Indian, *Indian J Tradit Know*, 9 (1) (2010) 173-174.
15 Sharma G C, Sharma A, Singh S K & Tonpay S D, Ethanomedicinal trends in Indian tradition for treatment of vitiligo, *J Med Plants Res*, 6(10) (2012) 1827-1833.
16 Kaur N, Kaur S & Sharma A K, A review on leucoderma and reported herbs for its treatment, *J Drug Deliv Therapeutics*, 2 (3) (2012) 53-59.
17 Lakhani D M & Deshpande A S, Various treatments for vitiligo: problems associated and solutions, *J Appl Pharmaceut Sci*, 4 (11) (2014) 101-105.
18 Bhatia H, Sharma Y P, Manhas R K & Kumar K, Traditional phytoremedies for the treatment of menstrual disorders in

district Udhampur, J&K, India, *J Ethnopharmacol*, 160 (2015) 202-210.

19 Kumar K, Sharma Y P, Manhas R K & Bhatia H, Ethnomedicinal plants of Shankaracharya Hill, Srinagar, J&K, India, *J Ethnopharmacol*, 170 (2015) 255-274.

20 Rao P K, Hassan S S, Bhellum B L & Manhas R K, Ethnomedicinal plants of Kathua district, J&K, India, *J Ethnopharmacol*, 171 (2015) 12-27.

21 Swami A & Gupta B K, Flora of Udhampur, (Bishen Singh Mahendra Pal Singh, Dehra Dun, India), 1998, p. 455.

22 Cruz E C & Andrade-Cetto A, Ethnopharmacological field study of the plants used to treat type 2 diabetes among the Cakchiquels in Guatemala, *J Ethnopharmacol*, 159 (2015) 238-244.

23 Andrade-Cetto A, Becerra-Jiménez J, Martínez-Zurita E, Ortega-Larrocea M P & Heinrich M, Disease-consensus index as a tool of selecting potential hypoglycemic plants in Chikindzonot, Yucatan, México, *J Ethnopharmacol*, 107 (2006) 199-204.

24 Gao C, Yang L, Chen M & Zhang H, Principles of differentiation and prescription for vitiligo in traditional Chinese medicine based on a literature investigation, *Integr Med Int*, 2 (2015) 149-156.

25 Tabassum N & Hamdani M, Plants used to treat skin diseases, *Pharmacogn Rev*, 8 (15) (2014) 52-60.

26 Murray R D H, Mendez J & Brown S A, The Natural Coumarins: Occurrence, Chemistry and Biochemistry, (John Wiley & Sons, New York, USA), 1982, p. 702.

27 Wu C S, Lan C C, Wang L F, Chen G S, Wu C S, *et al*., Effect of psoralen plus ultraviolet a irradiation on cultured epidermal cell in vitro and patients with vitiligo in vivo, *Brit J Dermatol*, 156 (1) (2007) 122-129.

28 Larbat R, Hehn A, Hans H, Schneider S, Jugde H, *et al*., Isolation and functional characterization of CYP71AJ4 encoding for the first P450 monooxygenase of angular furanocoumarin biosynthesis, *J Biological Chem*, 284 (8) (2009) 4776-4785.

29 Honigsmann H, Wolff K, Fitzpatrick T B, Pathak M A & Parrish J A, Oral photochemotherapy with psoralens and UVA (PUVA): Principles and Practice, In: *Dermatology in General Medicine*, 3rd ed, edited by T B Fitzpatrick, M Freedberg, A Z Eisen, K Wolff, K Frank Austen, L A Goldsmith & S I Katz, (Mc Graw Hill Book Company, New York), 1987, p. 1533-1558.

30 Vaidya A D, Reverse Pharmacological correlates of Ayurvedic drug actions, *Indian J Pharmacol*, 38 (2006) 311-315.

31 Dharmananda S, Ayurvedic herbal medicine and its relation to Chinese herbal medicine http://wwwitmonlineorg/arts/ ayurherbhtml, 2011.

32 Gupta A K, Neeraj T & Madhu S, Quality Standards of Indian Medicinal Plants, Vol 3, (ICMR, New Delhi), 2005, p. 290-298.

33 Arora R, Dhaker A S, Adhikari M, Sharma J, Chawla R, *et al*., Radical scavenging and radiomodulatory effects of *Psoralea corylifolia* L. substantiated by in vitro assays and EPR spectroscopy, *Zeitschrift für Naturforschung* C, 66 (1-2) (2011) 35-46.

34 Colucci R, Dragoni F, Conti R, Pisaneschi L, Lazzeri L *et al*., Evaluation of an oral supplement containing *Phyllanthus emblica* fruit extracts, vitamin E and carotenoids in vitiligo treatment, *Dermatologic Therapy*, 28 (1) (2015) 17-21.

35 Guo J N, Weng X C, Wu H, Li Q H & Bi K S, Antioxidants from a Chinese medicinal herb—*P. corylifolia* L., *Food Chem*, 91 (2005) 287-292.

36 Tsai W J, Hsin W C & Chen C C, Antiplatelet flavonoids from seeds of *Psoralea corylifolia*, *J Natural Products*, 59 (1996) 671-672.

37 Lim S H, Ha T Y, Ahn J & Kim S, Estrogenic activities of *P. corylifolia* L. seed extracts and main constituents, *Phytomedicine*, 18 (2011) 425-430.

38 Latha P G, Evans D A, Panikkar K R & Jayavardhanan K K, Immunomodulatory and antitumour properties of *P. corylifolia* seeds, *Fitoterapia*, 71 (2000) 223-231.

39 Ferra´ndiz M L, Gil B, Sanz M J, Ubeda A, Erazo S, *et al*., Effect of bakuchiol on leukocyte functions and some inflammatory responses in mice. *J Pharmacy Pharmacol*, 48 (1996) 975-980.

40 Holick M, Sunlight and vitamin D for bone health and prevention of autoimmune disease, cancer and cardiovascular disease. *Am J Clin Nutr*, 80 (supp) (2004) 1678S-1688S.

41 Suresh K & Vasudevan D M, Augmentation of murine natural killer cell and antibody dependent cellular cytotoxicity activities by *Phyllanthus emblica*, a new immunomoldulator, *J Ethnopharmacol*, 44 (1994) 55-60.

42 Zaynoun S T, Aftimos B G, Abi A L, Tenekjian K K, Khalidi U, *et al*., *Ficus carica* L.: isolation and quantification of the photoactive components, *Contact Dermatitis*, 11 (1) (1984) 21-25.

43 Chunyan C, Bo S, Ping L, Jingmei L & Ito Y, Isolation and purification of psoralen and bergapten from *F. carica* L. leaves by high-speed countercurrent chromatography, *J Liq Chromatogr Rel Tech*, 32 (1) (2009) 36-43.

44 Chauhan S, An overview of blood purifier, *Int J Pharmacy*, 4 (2013) 8-10.

45 Kumar N S, Nair A S, Nair A M & Murali M, Pharmacological and therapeutic effects of triphala - A literature review, *J Pharmacogn Phytochem*, 5 (3) (2016) 23-27.