



Phytomedicinal Recipes Used for the Treatment of Oral Diseases in Tehsil D.I.Khan, District Dera Ismail Khan, K.P.K, Pakistan

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ABSTRACT

The present study was conducted during 2020-2021 to assess, record, and report phytomedicinal recipes in Tehsil D.I.Khan, District Dera Ismail Khan KPK. The study was focused on documentation of traditional knowledge of local peoples about the use of medicinal plants as ethno medicines. For this purpose 28 locations of Tehsil D.I.Khan was surveyed such as Taheem Abad, Nayi chungi, Faqir Abad, Madni town, Mohallah khaglan faqir wala, Shahalum Abad choak, Zakori town, Basti sheikhanwali, Indus colony, Girsal, Thoya Fazil, Mohallah hayatullah, Islamia colony, Ashiana center, Chandni choak, Yarik, Eid gah, Shor Kot, Grid road, Dera town, Jail colony, Madina colony, Chaman choak, Din pur, Zaffarabad colony, Bagh wali Gali, and Nizam pump Muryali. About 87 local participants and local traditional health practitioners (hakims) and herb sellers (pansars) with 74 local females (85%) 8 local males (9%), 4 traditional health practitioners (hakims) (4%), and 1 (2%) herb seller were interviewed for this purpose. In total 68 plants belonging to 34 families and 58 genera were found ethno medicinal important. To determine the most frequently used plant species for treating a particular ailment category by local people, the Fidelity Level (FL%) and the Relative Frequency of Citation (RFC) were used to indicate the local importance of a species. Based on the RFC values, the most valuable and cited medicinal plant species used by the traditional drivers are *Eugenia caophyllata* having (RFCs=31.39) and *Salvadora persica* L. (RFCs=18.60). *Allium sativum*, L., *Allium cepa*, L., *Camellia sinensis*, var. *assamica* (masters) Kitam., *Elettaria cardamomum*, Maton., *Eruca sativa*, Miller, *Foeniculum vulgare*, Mill, *Glycyrrhiza glabra*, Boiss, *Musa accuminata*, Colla., *Ocimum basilicum*, L., *Piper nigrum*, Beyrex, *Pisum sativum*, sub sp. *Arvense* L., *Salvadora persica*, L., *Withania coagulans*, Dunal in DC. Had Fidelity Level (FL=100%), while *Ferula asafetida*, Linn. (83%), *Aloe barbadensis* (77.7%), *Calotropis procera*, Scbrad. (75%) had the highest FL which indicates their good healing potential against specific diseases.

Keywords: Phytomedicinal recipes; Oral diseases; Tehsil Dera Ismail Khan; Relative frequency of citation; Fidelity level

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INTRODUCTION

D.I. Khan is the southernmost district of Khyber Pakhtunkhwa (K.P.K), Pakistan. Most of the D.I Khan district is a dry alluvial plain commonly referred to as "daman". The only hills, within the district, are those of the Kishore range which lies in the northeastern part. The Kishore Rang is also known as ratta koh or koh e surkh, meaning the red mountain.

It runs close to the Indus River, in the northeast to south-direction. The district is bounded on the north Tank and Lakki Marwat districts, on the east by Mian Wali and Bhakkar districts of Punjab, on the south Dera Ghazi Khan district of Punjab, and on the west tribal area adjoining Dera Ismail Khan district.

In Islam, diseases are cured in two ways, first the cure of the soul through prayers, and second the cure of ailments through medicines. Cure of diseases through medicinal plants is always a salient feature of Islamic teaching and preaching. Islamic medicine started from Hazrat Adam (A.S.) and was completed at Hazrat Muhammad (Sallallahu Alayhi Wassallam) but search and compiling of these medicines is continued throughout the world. Al-Quran describes the importance of plants in different Surahs as in Al-Momeenoon, Al-Rehman, Al-Bakra, and Al-Inaam.

Our Holy Prophet (Sallallahu Alayhi Wassallam) used and recommended medicinal plants for various ailments and food. Oral health is the window to an individual's overall health. Good oral health contributes positively to one's physical, mental, and social well being. Dental caries remain the most important dental health problem in developing countries.

Scientific reports in the past decade signal an alarming increase in the global prevalence of dental caries in children and adults, primary and permanent teeth, as well as coronal and root surfaces. The multifactorial basis for the development of dental caries combined with its association with low socioeconomic status has always remained a matter of concern for health care professionals. However, several effective, evidence based prevention strategies and various management protocols have been developed once the disease occurs (Figure 1) [1,2].

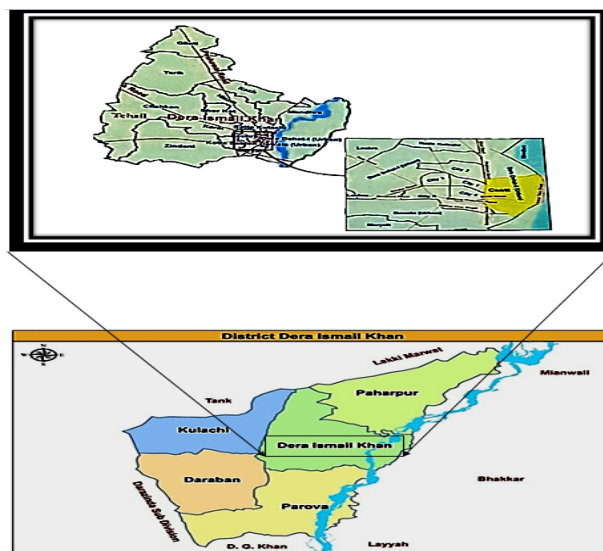


Figure 1: Map of Tehsil D.I.Khan, KPK.

Humans have sought cures for diseases in nature since ancient times; even recently, the use of herbal medicines in dietary supplements, energy drinks, multivitamins, massage, and weight loss products has gained popularity. There is therefore a real need to document the medicinal plant species in Pakistan which are commonly used in the treatment of various oral diseases, before this information is lost, as well as to help inform further pharmacological, phytochemical, and clinical studies. The present study aimed to document the traditional knowledge of medicinal plants used for the treatment of oral diseases in Tehsil D.I. Khan [3,4].

MATERIALS AND METHODS

Study Design

This study set to determine the phytomedicinal recipes used by traditional healers to treat oral diseases was conducted as a cross-sectional study. This research work was conducted over almost 6 months started on 14 February 2021 and continuing up to July 2021. To facilitate and complete the study following steps were undertaken [5,6].

Instruments

The types of equipment used during the research work were pencil, notebook, digital camera, and a self-administered questionnaire used to elicit information from traditional healers. Those traditional healers who were unable to read or

write were interviewed and their responses were captured [7].

Study Area

Tehsil Dera Ismail Khan was selected for the study because it has a rich flora of medicinal, aquatic, and other useful plants. for data collection, the following 27 locations were surveyed such as Taheem Abad, Nayi Chungi, Faqir Abad, Madni town, Mohallah Khaglan Faqir Wala, Shahalum Abad Choak, Zakori town, Basti Sheikhanwali, indus colony, Girsal, Thoya Fazil, Mohallah Hayatullah, Islamia colony, Ashiana center, Chandni Choak, Yarik, Eid Gah, Shor Kot, Grid Road, Dera town, Jail colony, Madina colony, Chaman Choak, Din Pur, Zaffarabad colony, Bagh Wali Gali [8].

Demographic Information of the Study Participants

Demographic characteristics of the informants were documented through semi structured interviews and group

conversations with local inhabitants. A total of 87 local participants and local traditional health practitioners (hakims) and herb sellers.

Female interviews: Interviews are conducted by local females mostly. about 64 local females (83%) are interviewed for the whole study.

Male interviews: About 8 local males (10%) are interviewed for the study.

Herbal doctors and herb sellers: 4 traditional health practitioners (hakims) (5%) and 1 (2%) herb sellers were questioned.

Informants Ages: Informants, with diverse ages (35–45, 46-55, 56-65, and above 65 years of age), from several settlements (mentioned above) belonging to several local tribal communities, were interviewed ([Table 1](#)).

Table 1: Demographic profile of informants.

S.No	Variable	Categories	No. of persons	Percentage (%)
1	Informant category	Herbal doctors	4	4.59
		Herb seller	1	1.14
2	Gender	Local peoples	82	94.25
		Females	74	85.05
		Males	13	14.94
3	Age	Less than 20	1	1.14
		20-30	22	25.28
		31-40	15	17.24
		41-50	18	18.68
		51-60	14	16.09
		More than 60	17	19.54
4	Experience of herbal doctors	10-20 years	1	1.14
		20-30 years	2	2.29
5	Experience of herb seller	More than 30	1	1.14
		More than 20 years	1	1.14

Procedure

Frequent visits were arranged to collect information about the traditional knowledge of medicinal plants used by the local people of Dera Ismail Khan. The questionnaire was designed in english to collect ethno medicinal knowledge of medicinal plants used against oral diseases within a community. The research was unique in that the emphasis was both on males and females. Also, the emphasis was on traditional health practitioners (hakims) and herb sellers (pansies). The interview was carried out in various areas an informant was firstly introduced briefly with the aim of the

study. Interviews were taken from the local female of different ages in homes about various medicinal plants used for oral diseases. The data was collected in local languages such as saraiki, urdu and was translated into english. Data on the informant's demography, medicinal plant's local names, botanical names, parts used, ingredients, diseases treated, method of preparation, mode of utilization, and route of administration were recorded [9].

Data Analysis

To analyze the documented data, we applied quantitative ethno botanical indices such as the Fidelity Level (FL) and Relative Frequency of Citation (RFC) [10,11].

Fidelity Level (FL)

Fidelity Level (FL) is the percentage of traditional informants claiming that the given plant species report for the same major ailment. The Fidelity Level (FL%) was calculated to rank the recorded plant species based on their claimed relative efficacy. It indicates the proportion of informants who cited the uses of certain plant species to cure a specific disease in a study area. FL was calculated for the most regularly reported diseases or ailments. It was given by the following formula:

$$FL (\%) = (Ip/Iu) \times 100$$

Where 'Ip' is the number of informants that claimed the use of certain plant species for a particular disease and 'Iu' is the total number of informants citing the species for any disease or ailment. The high value of FL (%) shows the reputation of certain species over other plants to cure a particular disease as high value approves the high rate of plant usage against a definite ailment. MPs that are not regularly used have low FL and the informants commonly disagree on their potential. Te MPs that were cited only by one informant to cure a precise ailment were not considered in the FL ranking [12-14].

Relative Frequency of Citation (RFC)

The RFC indicates the local significance of each species and is based on the number of informants who reported a species concerning the total number of informants in the study. The most commonly used plant species in the study area will always have the highest RFC.

$$RFC = FC / N \times 100$$

Where RFC stands for the relative frequency of citations; FC (Frequency of Citations) represents the number of participants that mentioned the use of each species and N represents the total number of informants that participated in the study [16].

RESULTS

Ethno Botanical Findings

Demographic Data of Informants: Total 87 interviews including 74 females and 13 males were conducted in the present study of oral diseases. Oral disease information is mostly confirmed to women in the study area.

Medicinal Plants Study

The present study provides information on ethno medicinal uses of 68 plants belonging to 34 families and 58 genera were found ethno medicinal important. All the identified species and their ethno medicinal information are elucidated. Out of 34 families, the dominant family with the highest number of

medicinal plants was fabaceae (7), followed by solanaceae (6), apiaceae (umbelliferae) and zingiberaceae were (5), lamiaceae (4), myrtaceae, piperaceae, and moraceae (3), arecaceae, liliaceae, rosaceae, theaceae, euphorbiaceae and brassicaceae (2), followed by salvadoraceae, puniceae, aloaceae, musaceae, plantaginaceae, apocynaceae, oleaceae, poaceae, verbenaceae, asteraceae, amaranthaceae, meliaceae, malvaceae, sapindaceae, asclepiadaceae, lauraceae, cucurbitaceae, rutaceae, ranunculaceae, juglandaceae were represented by 1 species each. Different parts of the medicinal plants are used as medicine by the local peoples [15,16].

Plant Part Used

Different parts of medicinal plants were used as medicine by the local peoples. among the different plant parts, leaves (24%), seeds (23%), fruit (14%), were most frequently used for the treatment of diseases followed by whole plant, rhizome, and bark (7% each), flower and roots were (4%), latex and branches were (3% each), stem was (2%) while scales and bullets were (1% each) respectively.

Data Arrangement

The recipes on oral diseases were arranged in alphabetical order of botanical name followed by family, local name, disease name, parts used, ingredients, recipe, and action. Results were compiled, issues were discussed, and the conclusion was made for further research and future investigation.

Data Analysis

To analyze the documented data, we applied quantitative ethno botanical indices such as the Fidelity Level (FL) and Relative Frequency of Citation (RFC).

Relative Frequency of Citation (RFC)

To highlight prominent plant species used for the treatment of oral diseases in the tehsil D.I. Khan district, and aid in the selection of plant species for future detailed studies, all reported species were classified into four ranking classes (A,B,C,D) based on their RFC values. These classes were defined as first class (A) from 12% and above (08 species), second class (B) from 8 to 12% (15 species), third class (C) from 4 to 8% (30 species), fourth class (D) from 1 to 4% (15 species).

Fidelity Level (FL)

Fidelity Level (FL %) is used for species identification that is most preferred by local inhabitants for the treatment of certain ailments. In this study, we find the fidelity level of all those Medicinal Plants (MPs) which are cited by 6 or more informants for being used against a given ailments category. In the present study, fidelity levels ranged from 37.5-100% (Tables 2-4 and Figures 2-5).

Table 2: Highly utilized medicinal plant species used for the treatment of oral diseases of Tehsil D.I. Khan, District D.I. Khan along with utilization, FC Value, RFC (%), and their RFC class.

S.no	Botanical name	English/ Local name	Family	Habit	Parts used	Disease treated	Mode of utilization	FC value	RFC (%)	RFC class
1	<i>Achyranthes aspera</i> , L.	Prickly chaff flower, Poth Kanta	Amaranthaceae	H	Whole plant	Toothache	Ash	3	3.48	D
2	<i>Aloe barbadensis</i> .	Barbados aloe, Ghinkanvar, Aloe vera	Aloaceae	H	latex	Teeth weakening, toothache	Latex	9	10.46	B
3	<i>Allium cepa</i> , L.	Onion, Piyaz	Alliaceae	H	scales	Toothache	Raw form	6	6.97	C
4	<i>Alpinia galanga</i> , (Linn.) Sw.	Greater galangal shell powder, Blue ginger, Kolanjan	Zingiberaceae	H	Rhizome	Bad oral smell (halitosis)	Raw form	3	3.48	D
5	<i>Azadirachta indica</i> , Juss.	Neem, Bakanra, Indian lilac Margosa tree	Meliaceae	T	Branches, Flower, Leaves	Gums inflammation, Teeth cleaning, Mouth sores, Gums bleeding	Juice, Tooth stick	5	5.81	C
6	<i>Albizzia lebeck</i> , (L.) Benth.	Sirin, Siris tree	Fabaceae	T	Leaves	Gums infections	Paste	2	2.32	D
7	<i>Acacia modesta</i> , Wall.	Blackwood, Phulai, Palosa	Fabaceae	T	Stem stick	Toothache	Tooth stick	4	4.65	C
8	<i>Acacia nilotica</i> , (L.) Del.	Acacia, kikar	Fabaceae	T	Bark	Teeth weakening, Toothache, Teeth cleaning	Decoction, Powder	6	6.97	C
9	<i>Allium sativum</i> , L.	Garlic, lehsun	Alliaceae	H	bulblets	Toothache	Paste	7	8.13	B
10	<i>Brassica campestris</i> , Linn.	Mustard, Sarsoon	Brassicaceae	H	Seeds	Teethache	Oil	5	5.81	C
11	<i>Bombax ceiba</i> , Linn.	Berberry, Sumbal Silk cotton tree	Malvaceae	T	Bark	Gums bleeding	Powder	4	4.65	C
12	<i>Cuminum cyminum</i> , L.	Cumin, Sufed zeera.	Umbelliferae	H	seeds	Canker sores, Gums bleeding	Decoction	4	4.65	C
13	<i>Citrullus colocynthis</i> , L.	Bitter apple.	Cucurbitaceae.	H	Whole plant	Gums inflammation, Teeth cleaning,	Paste, Tooth stick	11	12.7	A

						Mouth sores, Gums bleeding				
14	<i>Cassia fistula</i> , Linn.	Golden shower, Amaltas, Gird nali.	Fabaceae	T	Seeds	Gums bleeding, Gum, inflammation	Decoction, Powder	10	11.62	B
15	<i>Citrus limon</i> , Burm. f.	Lemon, Nimbo	Rutaceae	S	Fruit	Gums infections, Tongue inflammation, Teeth cleaning, Toothache	Powder, Juice	13	15.11	A
16	<i>Curcuma longa</i> , Linn.	Turmeric, Haldi, Kurkamand	Zingiberaceae	H	Rhizome	Teeth worms, Gums infections, Tongue blisters	Paste, Juice	6	6.97	C
17	<i>Cocos nucifera</i> , linn	Coconut, Nariyal, Kacha kola. .coconut palm.	Arecaceae	T	Fruit	Canker sores, Gums bleeding	Oil	8	9.3	B
18	<i>Calotropis procera</i> , R.Br.	Apple of Sodom, Aak, akra, spalmaka, Aak, Ushar	Asclepiadaceae	S	Latex, Roots	Teeth ache, Pus in Gums	Latex	12	13.95	A
19	<i>Coriandrum sativum</i> , L.	Coriander, Dhanya	Umbelliferae	H	Seeds	Canker sores, Gums bleeding	Decoction, Raw form	5	5.81	C
20	<i>Curcuma zedoaria</i> , <i>Roscoe</i> .	White turmeric, Kachoor	Zingiberaceae	H	Rhizome	Toothache	Powder	4	4.65	C
21	<i>Camellia sinensis</i> , var. <i>assamica</i> <i>Kitam</i> .	The black tea plant, Assam tea plant, kali chai	Theaceae	S	Leaves	Toothache	Powder	7	8.13	B
22	<i>Camellia sinensis</i> , (L.) Kunze	Green tea, Sabz chai, Sabz chai.	Theaceae	S	Leaves	Tongue inflammation, Canker sores	Decoction	7	8.13	B
23	<i>Cinnamomum zeylanicum</i> , DC.	Cinnamon tree, Daarcheeni	Lauraceae	T	Bark	Teeth ache, Teeth worms	Paste, Oil	9	10.46	B
24	<i>Datura stramonium</i> , L.	Thorn apple, Datura	Solanaceae	H	seeds	Teeth ache	Powder	4	4.65	C

25	<i>Dodonia viscera</i> , (linn.) Jacq.	Hop bush, Alier, Sanatha	Sapindaceae	S	Leaves and seeds.	Gums bleeding, Mouth ulcer	Juice, Powder	2	2.32	D
26	<i>Elettaria cardamomum</i> , Maton.	Green cardamom, Choti elaichi	Zingibera ceae	H	Fruit	Bad oral smell	Raw form.	13	15.11	A
27	<i>Eugenia caophyllata</i> , L.	Clove, Laung, Lawang.	Myrtaceae	S	Flower buds	Toothache, Gums inflammation, Canker sores, Gums bleeding	Oil, Decoction	27	31.39	A
28	<i>Eucalyptus globules</i> , Labill.	Bluegum, Sufaida	Myrtaceae	T	Leaves, seeds	Pus in gums, Canker sores, Teeth worms	Decoction, Oil	6	6.97	C
29	<i>Eclipta prostrate</i> , L.	French daisy, Bhangra.	Asteraceae	S	Leaves	Tongue inflammation, Mouth ulcer	Juice	3	3.48	D
30	<i>Elymes repens</i>	Couch grass, Dab	Poaceae	H	Whole plant	Mouth sores	Decoction	2	2.32	D
31	<i>Eruca sativa</i> , Miller	Garden rocket, Tara mera, Usoo, Jamau Tharkhae sag.	Brassica ceae	H	Seeds	Toothache	Oil	6	6.97	C
32	<i>Ferula asafetida</i> , Linn.	Devil's dung, Hung, Hing	Umbelliferae	H	Fruit	Teeth ache, Teeth worms	Raw form	6	6.97	C
33	<i>Ficus benghalensis</i> , L.	Banyan tree, Bargad	Moraceae	T	Latex	Gums bleeding	Latex, Raw form.	4	4.65	C
34	<i>Ficus carica</i> , L.	Fig, Angeer	Moraceae	T	Fruit	Canker sores, Mouth ulcer.	Decoction	3	3.48	D
35	<i>Ficus reliogosa</i> , L.	Peepal, bodhi tree	Moraceae	T	Leaves	Teeth weakening	Decoction	3	3.48	D
36	<i>Foeniculum vulgare</i> , Mill.	Fennel, Sonf, Kalvo	Umbelliferae	H	Seeds	Bad oral smell	Raw form	8	9.3	B
37	<i>Glycyrrhiza glabra</i> , Boiss.	Liquorice, Mulathi	Fabaceae	H	Rhizome	Canker sores	Decoction	6	6.97	C
38	<i>Juglans regia</i> , L.	Walnut, Akhrot.	Juglandaceae	T	Bark	Teeth cleaning,	Tooth stick	9	10.46	B

						Teeth strengthening, Mouth freshness				
39	<i>Lavendula stoechas</i> , L.	French lavender, Astu-Kho-dus	Lamiaceae	S	Leaves	Every gums infection	Powder	1	1.16	D
40	<i>Musa accuminata</i> , Colla.	Banana, Kela	Musaceae	T	Fruit peel	Teeth whitening	Paste	6	6.97	C
41	<i>Mentha piperata</i> , L.	Peppermint, Sat - Pudina	Lamiaceae	H	Whole plant.	Canker sores, Mouth sores, Tongue inflammation	Oil	4	4.65	C
42	<i>Mentha spicata</i> , L.	Mint, Pudina, Pudina	Lamiaceae	H	Whole plant	Toothache, Tongue inflammation, Gums infections. Canker sores, Mouth freshness	Juice, Oil	8	9.3	B
43	<i>Nigella sativa</i> , L.	Kalwangi	Ranunculaceae	H	seeds	Gums bleeding.	Decoction	2	2.32	D
44	<i>Nicotiana tobaccum</i> , L.	Tobacco, tambaku	Solanaceae	H	Leaves	Teeth ache, Teeth weakening	Decoction, Powder	5	5.81	C
45	<i>Nerium oleander</i> , L.	Oleander, Kneer	Apocynaceae	T	Leaves	Mouth sores,	Raw form	3	3.48	D
46	<i>Ocimum basilicum</i> , L.	Basil, Niazboo, Babrai	Lamiaceae	H	Leaves	Mouth sores, Mouth freshness	Raw form	6	6.97	C
47	<i>Olea europia</i> , L.	Olive, Zeeton	Oleaceae	T	Fruit	Mouth sores	Juice	4	4.65	C
48	<i>Prunus amygdalus</i> , Boiss.	Almond, Badam	Rosaceae	T	Seeds	Canker sores, Mouth sores.	Paste, Oil	11	12.79	A
49	<i>Piper betle</i> , L.	Betel pepper. Paan	Piperaceae	S	Leaves	Bad oral smell, Gums strengthening	Raw form	4	4.65	C

50	<i>Phoenix dactylifera</i> , L.	Date, khajoor	Areaceae	T	Branches, Roots.	Teeth cleaning, Mouth ulcer	Tooth stick, Decoction	4	4.65	C
51	<i>Phyllanthus emblica</i> , Linn.	Gooseberry, Amla	Euphorbiaceae	T	Fruit	Every gums infection.	Decoction	3	3.48	D
52	<i>Punica granatum</i> , L.	Pomegranate, Anar.	Punicaceae	T	Leaves	Toothache	Paste	5	5.81	C
53	<i>Psidium guajava</i> , L.	Guava, Amrud	Myrtaceae	T	Leaves	Teeth cleaning, Toothache	Paste, Decoction	8	9.3	B
54	<i>Piper longum</i> , L.	Long pepper, Filfil Daraz, pappali	Piperaceae	S	Fruit	Canker sores, toothache, Gums weakening	Paste	5	5.81	C
55	<i>Piper nigrum</i> , Beyrex.	Pepper, Kali Mirch, Tor mirch	Piperaceae	H	Fruit	Teeth ache	Powder	10	11.62	B
56	<i>Plantago ovata</i> , Forssk.	Ispaghol, spogal seeds	Plantaginaceae	H	Seeds	Tongue blisters	Paste	3	3.48	D
57	<i>Pisum sativum</i> , subsp. <i>Arvense</i> L.	Split desi chickpea, Split yellow gram, Chana dal	Fabaceae	S	Seeds	Toothache	Raw form	11	12.79	A
58	<i>Ricinus communis</i> , L.	Castor plant, Arand	Euphorbiaceae	S	Seeds	Mouth blister Tongue inflammation	Oil	6	6.97	C
59	<i>Rosa indica</i> , Lindl.	Rose, Gulab	Rosaceae	S	Petals	Mouth sores, Bad oral smell	Decoction, Raw form	7	8.13	B
60	<i>Solanum lycopersicum</i> , L.	Tomato, Tamatar	Solanaceae	S	Fruit	Canker sores, Gums bleeding	Juice	3	3.48	D
61	<i>Solanum nigrum</i> , L.	Black nightshade, Mako	Solanaceae	H	Fruit	Toothache, Teeth worms	Inhalant	5	5.81	C
62	<i>Salvadora persica</i> , L.	Tooth stick tree, pilu	Salvadoraceae	T	Roots/ stem	Teeth cleaning	Tooth stick	16	18.6	A
63	<i>Solanum surattense</i> , Burm.f.	Yellow fruit nightshade, Kandharibu-ti, Mahokri.	Solanaceae	H	Leaves	Toothache	Decoction	3	3.48	D

64	<i>Trachyspermum ammi</i> , (L.) Sprague.	Bishops weed, Carom, Ajwain	Umbelliferae	H	Seeds	Teeth worms, Bad oral smell.	Oil	5	5.81	C
65	<i>Trigonella foenum-graecum</i> , L.	Fenugreek, Methe	Fabaceae	H	Leaves, stem	Canker sores, Gums inflammation	Decoction, Tooth stick	7	8.13	B
66	<i>Withania coagulans</i> , Dunal in DC.	Vegetable rennel, khamazoor, akri, paneer	Solanaceae	S	Seeds	Teeth worms	Inhalant	9	10.46	B
67	<i>Vitex negundo</i> , Linn.	Five leaved caste tree, Marwan, Banna	Verbenaceae	T	Bark, Leaves	Mouth ulcer, Toothache	Powder, Paste	4	4.65	C
68	<i>Zingibar officinale</i> , Rose.	Ginger, Adrak	Zingiberaceae	H	Rhizome	Toothache, Mouth blisters	Paste	6	6.67	C

*FC: Frequency of Citation (Number of informants); *RFC%: Relative Frequency of Citation percentage (RFC %); Herb (H); Shrub (S); Tree (T).

Table 3: Number of use reports for each ailment category and fidelity level (fl % = $ip/iu \times 100$) values of MPs cited by 6 or more informants for being used against a given ailments category. *ip* is the number of informants who independently indicated the use of a species for the same major ailment and it is the total number of informants who mentioned the plant for any major ailments.

S.No	Specie name	TW _i	TA	TW	GI	GB	TC	BOS	Gln	MS	TW _o	TS	PG	Tin	TB	MB _s	MUG _{st}	GSW	MF	TW _e	Major ailment category	Ip	Iu	FL
1	<i>Allium sativum</i> , L.	7																			Toothache	7	7	100%
2	<i>Allium cepa</i> , L.	6																			Toothache	6	6	100%
3	<i>Camellia sinensis</i> , var. <i>assamica</i> (Maters.) Kitam.	7																			Tooth ache	7	7	100%
4	<i>Elettaria cardamomum</i> , Maton.							13													Bad oral smell	13	13	100%
5	<i>Eruca sativa</i> , Miller	6																			Tooth ache	6	6	100%
6	<i>Foeniculum vulgare</i> , Mill.							8													Bad oral smell	8	8	100%
7	<i>Glycyrrhiza glabra</i> , Linn.													6							Tongue blisters	8	8	100%
8	<i>Musa accuminata</i> , Colla.	6																			Teeth whitening	6	6	100%
9	<i>Ocimum basilicum</i> , L.														6			2			Canker sores	6	6	100%
10	<i>Piper nigrum</i> , Beyrex.	10																			Tooth ache	10	10	100%
11	<i>Pisumsativum</i> , subsp. <i>Arvense</i> L.	11																			Tooth ache	11	11	100%
12	<i>Salvadora persica</i> , L.						16				2										Teeth cleaning	16	16	100%
13	<i>Withania coagulans</i> , Dunal in DC.											9									Teeth worms	9	9	100%
14	<i>Ferula asafetida</i> Linn.	5										2									Toothache	5	6	83%

15	<i>Aloebarbadensis</i>	7	2					Toothache	9	7	77.70%	
16	<i>Calotropis procera</i> (Aiton) W.T.Aiton	9			3			Toothache	9	12	75%	
17	<i>Cocos nucifera</i>		2			6		Canker sores	6	8	75%	
18	<i>Juglans regia</i> L.			9			2	1	Teeth cleaning	7	9	75%
19	<i>Rosa indica</i> Lindl.			2	5				Mouth sores	5	7	71.40%
20	<i>Cassia fistula</i> Linn.		7		3				Gums bleeding	7	10	70%
21	<i>Cinnamomum zeylanicum</i> DC.	6			4				Toothache	6	9	66.60%
22	<i>Eucalyptus globules</i> Labill.			2	4	1			Pus in gums	4	6	66.60%
23	<i>Curcuma longa</i> Linn.	2	1			4			Tongue blisters	4	6	66.60%
24	<i>Zingibar officinale</i> Roscoe	2				4			Canker sores	4	6	66.60%
25	<i>Ricinus communis</i> L.					4	3		Tongue inflammation	4	6	66%
26	<i>Prunus amygdalus</i> DC			5		7			Canker sores	7	11	63.60%
27	<i>Citrullus colocythis</i> (L.) Schrad.	6		2	7	3			Teeth worms	7	11	63.60%
28	<i>Psidiumguajava</i> L.	5		3					Toothache	5	8	62.50%
29	<i>Citrus limon</i> Benth.	2	2	8		1			Teeth cleaning	8	13	61.50%
30	<i>Eugenia caophyllata</i>	16	7	3		2			Tooth ache	16	27	59.20%
31	<i>Trigonella foenum- graecum</i> L.			4		3			Gums inflammation	4	7	57.10%
32	<i>Camellia sinensis</i> (L.) Kunze					4	3		Tongue inflammation	4	7	57.10%
33	<i>Acacia nilotica</i> (L.) Deliled.	3		1				2	Tooth ache	3	6	50%
34	<i>Azadirachta indica</i> A.juss.		2		1	3			Mouth sores	3	6	50%
35	<i>Mentha spicata</i> L.	2	1			3	2	2	Tongue inflammation	3	8	37.50%

Oral diseases: TWi: Teeth Whitening; TA: Tooth Ache; TW: Tooth Weakening; GI: Gums Infections; GB: Gums Bleeding ; TC: Teeth Cleaning ; BOS: Bad Oral Smell; Gin: Gums Inflammation; MS: Mouth Sores; Two: Teeth worms; TS: Tongue Sores; PG: Pus in Gums; Tin: Tongue Inflammation; TB: Tongue Blisters; MBs: Canker sores (Mouth Blisters); MU: Mouth Ulcer; GSt: Gums Strengthening; GSw: Gums Swelling; MF: Mouth Freshness; TWe: Teeth Weakening.

Table 4: Percentage of disease treated by traditional medicinal plants in Tehsil D.I.Khan.

S.NO	Disease	Number	Percentage (%)
1	Toothache	27	21.25%

2	Canker sores	17	13.38%
3	Gums bleeding	9	7.08%
4	Teeth worms	8	6.29%
5	Every gum infections	8	6.29%
6	Tongue inflammation	7	5.51%
7	Teeth cleaning	7	5.11%
8	Bad oral smell(Halitosis)	6	4.72%
9	Gums inflammation	6	4.72%
10	Mouth sores	5	3.93%
11	Mouth ulcer	5	3.93%
12	Tooth weakening	4	3.14%
13	Tongue sores	4	3.14%
14	Pus in gums	3	2.36%
15	Mouth freshness	3	2.36%
16	Tongue blisters	2	1.57%
17	Teeth whitening	2	1.57%
18	Gums strengthening	1	0.78%
19	Gums swelling	1	0.78%

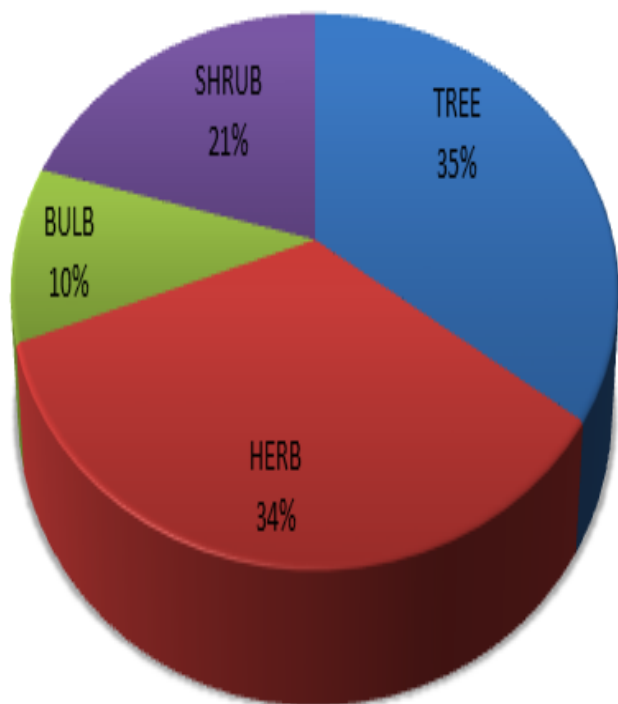


Figure 2: Plant life form reported for the treatment of oral diseases in Tehsil D.I.Khan.

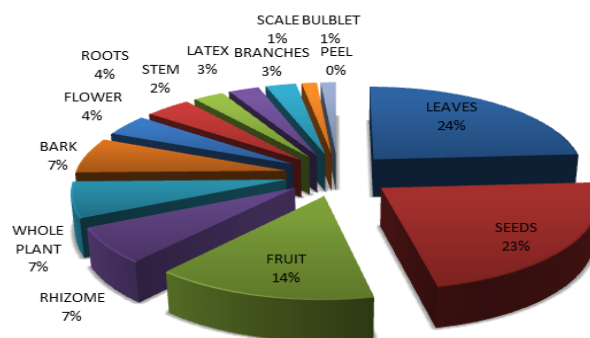


Figure 3: Percentage of plants parts used for oral diseases.

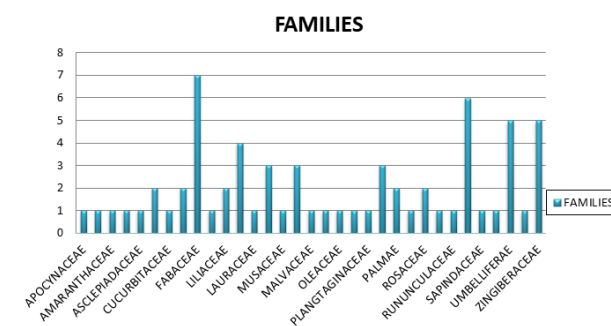


Figure 4: Families of medicinal plants reported for the treatment of oral diseases in Tehsil D.I.Khan.

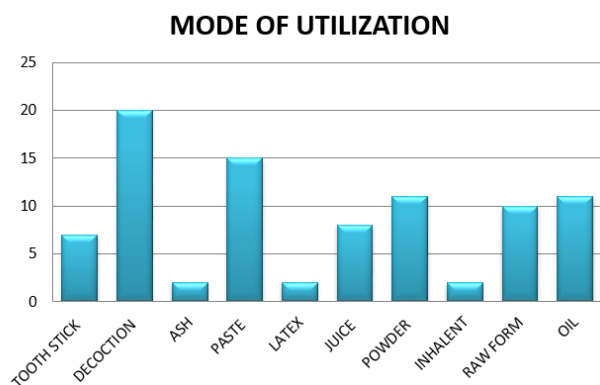


Figure 5: Mode of the utilization of medicinal plants used for the treatment of Oral diseases.

DISCUSSION

The current study shows that peoples in the district Dera Ismail Khan (D.I.Khan) of K.P.K (Khyber Pakhtunkhwa) use herbal remedies for the treatment of minor to major problems of oral diseases. During the study, it becomes clear that these people used 68 different plants as their primary medicine for the treatment of oral diseases. People got 102 recipes out of these 68 plants species. These 68 plant species belong to 34 families and 58 genera. Out of the species described above 1 species is of gymnosperm, 12 species are monocots and the remaining 55 species are of dicots in angiosperms families. The most commonly cited life form in the present study was the 24 herbs species (34%), which is consistent with the findings of previous studies. According to Samia Ali, et al. the common use of herbs is due to their easy manipulation in herbal recipes, while suggests that the more frequent use of herbs may be due to their diverse geographic range along roadsides, home gardens, farmlands. Based on our findings and previous studies [17,18], herbs are frequently used due to their easy accessibility in wild habitats and their common availability. A novel finding of the present study was 23 tree species (35%) being the second most frequently cited life form reported. 14 species are shrubs (21%) and 7 species are bulbs (10%). It is clear from that leaves (24%) were the most commonly used plant part in herbal recipes for treating oral diseases. While seeds (23%) being the second most cited plant part used for the treatment of oral diseases, followed by fruit (14%), whole plant, rhizome, and bark (7% each), flower and roots were (4%), latex and branches were (3% each), Stem was (2%) while scales and bulblet were (1% each) respectively. Roots were also commonly used as tooth sticks for cleaning teeth and gums, while in some cases; powdered root bark and juice were also reportedly used for treating oral disorders. Looking at modes of preparation reported by informants, it was observed that many of the local peoples of Tehsil D.I.Khan used decoctions (23%) as a gargle for the treatment of different oral while many plant parts in the form of paste (17%), powder and oil (13%), raw form (11%), juice (9%), tooth stick (8%), ash, latex, and inhalants are (2%) were

used. Herbal doctors frequently provided herbal formulas in the form of powders and oils, which may be due to their ease of storage and use in various modes of application in many cases, folk recipes are prepared with mixtures of two or more plant species with different plant parts being used, and this mixture of different plants and plant parts may contribute to synergistic effects within herbal formulations. As is obvious from that different medicinal plants are used for the treatment of various oral diseases such as toothache (21.6%) followed by white canker sores (13.6%), every gums infection, gums bleeding and bad oral smell (6.4%), teeth cleaning, teeth worms and tongue inflammation (5.6 %), gum inflammation (4.85%), mouth sores and mouth ulcer (4%), teeth weakening and tongue sores (3.2%), pus in gums and mouth freshness (2.4%), tongue blisters and teeth whitening (1.6%), gums strengthening and gums swelling (0.8%), etc respectively. The study revealed that sometimes one medicinal plant is used for treating or curing more than one disease or in some cases more than one plant is used for treating the same disease such as *Acacia modesta*, wall., *Allium sativum* L., *Aloe barbadensis*, *Achyranthes aspera* L., *Acacia nilotica* (L.) del, *Allium cepa* L., *Brassica compestris* Linn, *Cinnamomum zeylanicum*, DC. *Citrullus colocynthis* L., *Calotropis procera*, Scbrad., *Citrus limon*, benth., *Curcuma zedoaria* (christm) roscoe., *Camellia sinensis* var. *assamica* (maters.) Kitam., *Datura stramonium* L., *Eruca sativa*, Mill, *Eugenia caophyllata*, *Ferula asafetida* Linn., *Mentha spicata* L., *Nicotiana tobaccum* L, *Punica granatum* L., *Psidium guajava*, L., *Piper nigrum*, beyrex., *Pisum sativum*, subs. *Arvense* L., *Piper longum* L., *Solanum nigrum* L., *Solanum surattense*, burm. F., *Zingiber officinale* (toothache), *Aloe barbadensis*, *Acacia nilotica* (L.) del., *Ficus reliogosa*, *Juglans regia* L., *Nicotiana tobaccum* (teeth weakening), *Alpinia galanga* Linn., *Coriander sativum* L., *Elettaria cardamomum*, maton., *Nigella sativa* L., *Rosa indica*, Lindi. (bad oral smell), *Azadirachta indica*, A. juss., *Citrus limon*, benth, *Phoenix dactylifera* L., *Salvadora persica* L., (teeth cleaning), *Azadirachta indica*, A.juss., *Citrullus colocynthis* L, *Cassia fistula* Linn., *Camellia sinensis* (L.) Kunze., *Eugenia caophyllata*, *Eclipta prostrate*, L., *Mentha spicata*, L., (gums inflammation), *Azadirachta indica*, A.juss, *Bombax ceiba* Linn, *Cassia fistula* Linn., *Cuminum cyminum*, L., *Dodonia viscera* (Linn.) Jacq., *Ficus benghalensis* L., *Nigella sativa* L., *Solanum lycopersicum* L, (gums bleeding), *Elymes repens*, *Nerium oleander* L., *Ocimum basilicum* L., *Olea europia* L., *Rosa indica* Lindi., (mouth sores). Similarly *Aloe barbadensis* (teeth weakening, toothache), *Acacia Nilotic* (L.) Del. (teeth weakening, gums bleeding, teeth cleaning), *Azadirachta indica*, adjusts. (Gums inflammation, teeth cleaning, mouth sores, gums bleeding), *Citrullus colocynthis* L. (gums inflammation, toothache, teeth worms, tongue sores.), *Calotropis procera*, scbrad (teeth ache, pus in gums), *Citrus limon*, benth (gums infections, tongue inflammation, teeth cleaning, toothache), *Curcuma longa* Linn., (teeth worms, gums infections, and tongue blisters), *Cassia fistula* Linn (gums bleeding, and gums inflammation.), *Cocos nucifera* (canker sores, and gums infections) *Coriander sativum* L., (canker sores, and bad oral smell), *Camellia sinensis*, (L.) Kunze. (tongue inflammation, and canker sores), *Cuminum*

cyminum L., (canker sores and gums bleeding), *Eugenia caophyllata* (toothache, gums inflammation, and canker sores), *Eclipta prostrata* L., (tongue inflammation, and mouth ulcer), *Eucalyptus globules*, Labill (pus in gums, canker sores, and Teeth worms), *Ficus benghalensis* L., (gums bleeding and gums swelling), *Juglans regia* L., (teeth cleaning, teeth strengthening, and mouth freshness), *Mentha piperata* L., (canker sores, mouth sores, and tongue inflammation), *Prunus amygdalus*, DC. (canker sores, and mouth sores), *Psidium guajava* L., (teeth cleaning, and toothache), *Ricinus communis* L., (mouth blister and tongue inflammation) *Solanum lycopersicum* L., (canker sores and gums bleeding), *Trigonella foenum graecum* L., (canker sores, and gums inflammation). Other medicinal plants include *Acacia modesta*, wall. (Toothache), *Achyranthes aspera*, L. (Toothache), *Albizia lebbeck* (L.) Benth (gums infections), *Allium cepa* L., (toothache), *Alpinia galanga* Linn., (bad oral smell), *Brassica compestris* Linn., (teethache), *Bombax ceiba* Linn., (gums bleeding), *Cinnamomum zeylanicum*, DC. (teethache), *Curcuma zedoaria*, roscoe (toothache), *Camellia sinensis*, var. *assamica* Kitam (toothache), *Datura stramonium*, L. (teethache), *Elettaria cardamomum*, Maton, (bad oral smell), *Eruca sativa*, miller (toothache), *Ficus reliogosa* (teeth hardening), *Foeniculum vulgare*, mill. (bad oral smell), *Glycyrrhiza glabra* Linn., (Canker sores), *Lavendula stoechas* L., (Every gums infection), *Musa accuminata*, colla, (teeth whitening), *Nerium oleander*, L. (mouth sores), *Olea europia*, L. (mouth white blisters), *Punica granatum* L. (toothache), *Piper nigrum*, beyrex, (teethache), *Phyllanthus emblica*, Linn, (every gums infection), *Pisum sativum*, subs. *Arvense* L. (toothache), *Plantago ovate*, forssk (tongue blisters), *Salvadora persica*, L. (teeth cleaning), *Solanum surattense*, *Burm f.* (toothache), *lithuania coagulans*, dunal in DC. (teeth worms), *Vitex negundo*, Linn. (mouth ulcer) are used for the treatment of oral diseases in Tehsil D.I.Khan. Fidelity Level (FL) is used for species identification that is most preferred by local inhabitants for the treatment of certain ailments. In the present study, fidelity levels ranged from 37.5% to 100%. Medicinal plants with high fidelity level and reported for one dental disorder were *Allium sativum*. L, *Allium cepa*, L, *Camellia sinensis*, var. *assamica* Kitam., *Elettaria cardamomum*, maton., *Eruca sativa*, miller., *Foeniculum vulgare*, mill, *Glycyrrhiza glabra*, Linn., *Musa accuminata*, Colla., *Ocimum basilicum*, L, *Piper nigrum*, beyrex, *Pisum sativum*, subs. *Arvense* L, *Salvadora persica* L, *withania coagulans*, dunal in DC. Each species is cited with FL% =100% for its particular use respectively (Table 3). Some other medicinal plant species reported with most cited dental disorders with their fidelity values; *Ferula asafetida*, Linn. (FL=83%), *Aloe barbadensis* (FL=77.7%), *Calotropis procera*, Scbrad. (FL=75%) etc for toothache, *Cocos nucifera* (FL=75%) for canker sores, *Juglans regia*, L. (FL=75%) for teeth cleaning, *Rosa indica* Lindl. (FL=71.4%) for mouth sores, *Cassia fistula* Linn. (FL=70%) for gums bleeding, *Cinnamomum zeylanicum*, DC. (FL=66.6%) for toothache, *Eucalyptus globules* Labill. (FL=66.6%) for pus in gums, *Curcuma longa*, Linn.(FL=66.6%) for tongue blisters, *Zingibar officinale*, roscoe (FL=66.6%) for canker sores, *Ricinus communis*, L. (FL=66%) for tongue inflammation, *Prunus amygdalus*, DC. (FL=63.6%) for canker

sores etc. In the present study, the RFC ranged from 1.16 to 31.39% as shown in Table 2. *Eugenia caophyllata* (RFC=31.29%), *Salvadora persica*, L. (RFC=18.60%), *Elettaria cardamomum*, maton. (RFC=15.11%), *Citrus limon* Benth. (RFC =15.11%), *Calotropis procera*, scrbad. (RFC=13.95%), *Pisum sativum*, subs. *Arvense* L. (RFC=12.79%), *Prunus amygdalus*, DC. (RFC=12.79%), *Citrullus colocynthis*, L. (RFC=12.79%), had the highest RFC values with RFC class A, while *Elymes repens* (RFC=2.32%), *Nigella sativa*, L. (RFC=2.32%), *Lavendula stoechas*, L. (RFC=1.16%) properties indigenous learning concerning the utilization of their medicinal plants has been utilized for essential social insurance around the globe to treat affliction found in oral diseases. It is necessary to integrate herbal remedies into the treatment of oral diseases such as people can make use of herbs in taking care of their selves. The use of herbal medicine is beneficial because they are easily available its cost is low and it has no side effects. The precious ethno botanical knowledge about plants must be transferred to the younger generation, which is essential. The data can be used in the future for pharmacological studies.

CONCLUSION

Pakistan is rich in the biodiversity of plant species with a lot of traditional uses of plants species used for the treatment of oral disease. Usually, the older peoples were most familiar with the traditional use of medicinal plants. In the present study, 68 medicinal plant species were documented as used in the treatment of commonly occurring oral diseases, including toothache, mouth sores, canker sores, tongue inflammation, etc. It was observed that traditional herbalists and indigenous people use the majority of these plants in the form of decoctions, powders and tooth sticks, etc. A large number of local people especially the older ones believe in using medicines prepared from various plant materials. It is concluded from the Fidelity Level (FL%) and from the percentage of recipes used for the treatment of diseases that toothache, mouth sores, and canker sores, and bad oral smell are the most common diseases that are treated by medicinal plants recipes. The knowledge documented during this study consists of 68 plant species belonging to 34 families and 58 genera. Based on the RFC values, the most valuable and cited medicinal plant species used by the traditional drivers are *Eugenia caophyllata* having (RFCs=31.39) and *Salvadora persica* L. (RFCs=18.60), meaning that they were frequently cited by the informants. In this work, FL ranges from 100–35.5% of about 35 plant species which is very little. These plants with minimum FL should not be abundant as declining to remark them for future generation; a threat will rise for gradual depletion of the cultural knowledge. The most common cause of increased chance of loss of traditional knowledge in the local community especially the young generation is the modernization of the society so, it's very necessary to document the wealth of traditional knowledge. Therefore, comprehensive surveys about phytomedicinal recipes could be of significant value to conserve the medicinal plant wealth and related traditional knowledge. Younger people are less interested to know, sharing, and trying

conventional medicine practices and recipes. The use of herbal extracts for the control of oral diseases is considered an interesting alternative to synthetic microbial due to their lower negative impacts. Therefore, proper awareness among the local people about the importance of medicinal plants and their herbal use in various diseases is very necessary.

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