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Sanoon: A Specialized Dosage form for Dental Diseases in Traditional Persian Medicine

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ABSTRACT

Oral diseases such as tooth loss, periodontal disease, dental caries, oral mucosal lesions and oropharyngeal cancers are chief communal health troubles in the worldwide. Dental caries, as a type of dental diseases, affects 60–90% of school-aged children and the common of adults in the majority industrialized countries. Sanoon is a pharmaceutical dosage form designed for treatment of oral cavity diseasesin the traditional Persian medicine that contains all kinds of mono component or multi component dosage forms with the ability of gum tonic that is finely powdered and used by sprinkling or rubbing it to the gum and dental surfaces. The purpose of the present study is to discuss about different formulation of sanoon dosage form in traditional medicine and find confirmation of their effectiveness in the treatment of dental .

Keywords: Oral diseases, Dental caries, Sanoon, oropharyngeal cancers.

INTRODUCTION

Oral diseases such as dental caries, periodontal disease, tooth loss, oral mucosal lesions and oropharyngeal cancers are major public health problems in the worldwide[1].Despite low mortality of dental diseases, these disorders impact considerably on general health and quality of life. Teeth have important role in eating ability, primary digestion the food, speech, facial appearance and self confidence[2]. Dental caries, as a kind of dental diseases, affects 60–90% of school-aged children and the majority of adults in most industrialized countries[1]. Dental diseases impose economic burden to health care services. In some countries, the cost of treatment of dental caries is about 5 to 10 % of its total health budget[2].

From ancient times the mankind has used materials found in nature as a remedy for his various diseases[3]. Afterwards the application of herbal, mineral and animal parts for making medicaments improved impressively in major traditional medicines: Chinese, Ayurveda and Persian[4-5]. Among these medical systems Traditional Persian Medicine (TPM) is one of the richest and oldest systems with various medical and pharmaceutical manuscripts[6-7]. Medieval Persian physicians and philosophers had described anatomy of the oral structure including mouth and tongue, tooth and gingiva and lips and related diseases and their treatments comprehensively[8]. A brief search in TPM literatures shows more than one hundred dosage forms, including some specialized ones like Sanoon[6-7]. Sanoon is a pharmaceutical dosage form

designed for treatment of oral cavity diseases, particularly dental problems in TPM. It contains all kinds of mono component or multi component dosage forms with the ability of gum tonic that is finely powdered and used by sprinkling or rubbing it to the gum and dental surfaces[7-10]. and alternative to conventional treatment.

METHOD

In this study, first we searched TPM books or pharmaceutical manuscripts of Persian scientist during 9th to 18th century AD such as Al-Abniyah an haqaiq al-adviyah, the Canon (Qanun-fi-tebb) , Makhzan-al-Aadvia, Tuhfatul-mumenin, main Qarabadin books of Traditional Persian Medicine for finding different dosage forms used in treatment of oral cavity diseases. In this preliminary study, we found out that sanoon is the most exclusive dosage forms in treatment of dental diseases. In the second part of this study, different types of sanoon were derived from Qarabadins books such as Canon of Medicine, Qarabadin Kabir, Qarabadin Shafahi, Qarabadin Ghaderi, Qarabadin Salehi, Tuhfatul-mumenin. Qarabadins books are the main Traditional Persian pharmacological (TPP) text books that explain the preparation procedures, components and indications of compound drugs. All herbs used in these manuscripts with their indications and the processes of the preparation were extracted. Then the most repetitive plants were derived and listed. Afterwards we matched listed medicinal plant names with scientific names. At last these plants were screened in electronic databases including Google scholar, Scopus, PubMed to find possible evidence of their efficacy in the treatment of dental diseases in Modern medicine. The positive findings have been shown in the result section. Because medicinal plants used individually in a form of sanoon,in this part of the study, these herbs with their nature and indications were also derived from Makhzan-al-Aadvia, Al-Abniyah an haqaiq al-adviyah, Tuhfatul-mumenin,Qanun fi- tebb, Al-Havi.

RESULT

Some types of oral dosage forms suggested in Traditional Persian Pharmacological text books for treatment of oral cavity disorders. The most common dosage forms included; oral fumigation(Bakhoor), gurgle(Gharghareh), mouthwash(Mazmazeh), tooth powder(Sanoon), oral dusting powder(Zaroor) and oral cooling(Barood). Sanoon, tooth powder, is a specific dosage form for dental diseases that rubbed on the teeth and gingiva. Sanoon was used in the form of powder. For preparing Sanoon, medicinal herbs that are used in this dosage form need to be dried and then usually grinded. According to the indications, the particles of the powder may be very fine or coarse. For example, in strengthener Sanoon, used plants must be grinded finely as possible.In return, particle of polisher Sanoon should be coarse and incomplete powdered.In this formulation, salt were parched and added to the powder. Brushing teeth is necessary before using Sanoon and stomach must be empty. For applying Sanoon,first wet the index finger with water, then put the finger into the tooth powder and rub it on the teeth and gum twice a day. During the usage of Sanoon, Keep the mouth open and rub it sequentially. Wait an hour until saliva be removed. Sanoon as a specific dosage form was administered for dental diseases like toothache and inflammation, loose teeth, discoloration of the teeth, aphthous, halitosis, carious teeth, oral sores, gingival sores and gingival health. The shelf life of Sanoon was 1-6 month. Table 1 shows medicinal plants were used individually in TPP as Sanoon with their scientific names, traditional names, nature, indications and parts used. Nature is the predominant quality[10]. Few formulations of Sanoon dosage forms that were used in TPP have been shown in Table 2. Formulation names, indications, ingredients, scientific names of plant drugs and preparation procedures are also indicated in Table 2.

Repetitive medicinal plants used in the formulations of Sanoon are Punica granatum, Terminalia chebula, Tamarix gallica, Cyperus lungus, Quercus Spp, Piper nigrum L. Peganum harmala, Syzygium aromaticum(Eugenia caryophyllata Thunb) ,Rhus coriaria, Anacyclus pyrethrum ,Rosa damascene. Pharmacological properties of these plants have been described in the last part of result section.

Dental powder (sanoon)Scientific name	Traditional name	Nature	Indications	Parts used
Cymbopogon citratus	Ezkher	Hot & dry	Toothache- Gums weakness	Aerial parts
Hyoscyamus niger l.	Banj	Cold & dry	Toothache	Seed
Ficus carica l.	Teen	Hot & moist	Toothache- Gums weakness- Discoloration of the teeth	Fruit-Latex
Opopanax chironium	Javoshir	Hot & dry	Tooth ache	Latex
Ceratonia siliqua	Kharnoob	Cold & dry	Toothache- Dental weakness	Aerial parts
Pistacia lentiscus l.	Mastaki	Hot & dry	Toothache- Dental / Gums weakness- halitosis	Latex
Olea europaea	Zeitoun	Hot & dry	Toothache	leaves
Rosa canina	Nasrin	Hot & dry	Toothache	Flower
Curcuma longa	Zardchubeh	Hot & dry	Toothache	Root
Seidlitzia rosmarinus	Oshnan	Hot & dry	Discoloration of the teeth	branch
Pimpinella anisum	Anisun	Hot & dry	Discoloration of the teeth- halitosis	fruit
Phragmites communis	Ghasab	Cold & dry	Discoloration of the teeth- gingival bleeding	Inner part of the stem
Amygdalus communis	Badam	Hot & moist	Discoloration of the teeth- Dental / Gums weakness	fruit
Cocos mucifera	Narjil	Hot & dry	Discoloration of the teeth	fruit
Quercus lusitanica	Afes	Cold & dry	Dental / Gums weakness- aphthous	Fruit
Cyperus longus	Soad	Hot & dry	Dental / Gums weakness- halitosis	Root
Citrus medica	Otroj	Cold & moist	Gums weakness	Fruit pulp
Terminalia chebula	Halileh zard	Cold & dry	Gums weakness- gingival bleeding	fruit
Punica granatum	Jolnar	Cold & dry	Gums/dental weakness - halitosis - aphthous	Fruit
Moringa oleifera	Habbolban	Hot & dry	Gums weakness	Root
Rhus coriaria	Somag	Cold & dry	Gums weakness- aphthous -toothache	Latex
Calamus draco wild	Damolakhavein	Cold & dry	Gums weakness	Latex
Mentha pulegium	Fodenj	Hot & dry	Gums weakness	Leaf
Elletaria cardamomum	Hel	Hot & dry	Gums weakness- aphthous	fruit
Coriandrum sativum	Geshneez	compound	Gums weakness- gingival bleeding	Leaf
Cinnamomum comphora	Kafoor	Cold & dry	aphthous	Latex
Rosa damascena	Golesorkh	compound	aphthous	Flower

Sanoon (teeth powder) Traditional name	**ingredients**	**indication**	**preparation**
Sanoon vajae[G.S]	Cyperus longus, Terminalia chebula, Embelia ribes, zingiber officinale, piper nigrum,piper longum, Jasminum officinale	Toothache	The medications should be grinded ,sifted , mixed and used
Sanoon vajae[G.K]	Punica granatum, Rhus coriaria, Cyperus longus, aquilaria agalocha roxb, Alon	Toothache	The medications should be grinded ,sifted and mixed in equal amounts
Sanoon mojarrab [G.K]	Cyperus longus, Arundinacea bambusa, Rosa damascene,Myrtus communis, Punica granatum,Areca catechu,Acacia arabica, Arhus coriaria	Toothache, gingival bleeding, Oral sores	Seven first medications in equal amounts with triple amounts of eighth should be grinded ,sifted and mixed
Sanoon jala[G.S]	Aquilaria agalocha roxb, Cyperus longus, salt, Terminalia chebula,areca catechu	Discoloration of the teeth	First all medications except the last one should be burnt and
Sanoon jala[T.M]	Cuttle bone,Burnt salt,Honey	Discoloration of the teeth	The medications should be mixed in equal amounts and rubbed on teeth rubbed on teeth. At the end of the process, brushing teeth is necessary.
Sanoon soorenjan[G.k]	Colshisum autumnale,Eugenia caryophyllata, Peganum harmala, Terminalia chebula, Santalum	Dental weakness	The medications should be mixed in equal amounts and rubbed on teeth
Sanoon [G.S]	album,Rosa damascene Alon,Artemisia herba-alba,Anacyclus pyrethrum`	Discoloration of the teeth, gingival	The medications should be mixed in equal amounts and rubbed on teeth
Sanoon ramak[m.a]	Queues lusitanica-Phoenix dactylifera- Punica granatum	bleeding ,halitosis gingival bleeding , Gums weakness	The medications should be mixed and kneaded with honey
Sanoon ghate khoon[GS]	curcuma longa-acacia Arabica- Punica granatum- Arhus coriaria-Queues lusitanica- Punica granatum-	gingival bleeding	The medications should be grinded , sifted and mixed in equal amounts
Sanoon yamani[G.SH]	Alon,Origanum dictamnus	gingival bleeding , halitosis	The medications should be grinded ,sifted and mixed
Sanoon taghviat	Punica granatum-aquilaria agalocha roxb- armenica volgaris- Pergamum harmala- bambusa	Gums weakness	The medications should be grinded ,sifted and mixed

lase[G.S]	arundinacea- Arhus coriaria- Cyperus longus- terminalia bellerica-eugenia caryophyllata- portulaca oleracea-Rosa damascena		
Sanoon mastaki[G.S]	Pistacia lentiscus l, Piper nigrum,Salt,	Dental / Gums weakness	The medications should be grinded ,sifted and mixed
Sanoon soorintijan[G.S]	Punica granatum, curcuma longa, Alon, Queues lusitanica	Dental caries , gingivitis	The medications should be grinded ,sifted and mixed
Sanoon namak[G.S]	Hordeum valgare,Queues lusitanica, Aquilaria agalocha roxb, Arhus coriaria,Peganum harmala, Elletaria cardamomum,Piper longum, Punica granatum, Cuttle bone,Eugenia caryophyllata,Anacyclus pyrethrum,salt	Dental caries , Discoloration of the teeth	The medications should be grinded , sifted and mixed and rubbed on teeth. At the end of the process, brushing teeth is necessary.
Sanoon ofoonat laseh[G.S]	Feagrans myristica, Cinnamomum zeylanicum, Piper cubeba,Costus sp, Punica granatum, Bambusa arundinacea,Rosa damascene, Plantago ovata, Punica granatum	gingivitis	The medications should be grinded ,sifted and mixed
Sanoon gholae[G.K]	Scabiosa arvensis, Bambusa arundinacea- Plantago major, `Terminalia chebula- Punica granatum, Europaea, Peganum harmala	aphthous	The medications should be grinded ,sifted and mixed
Sanoon bakhrolfam[G.S]	Santalum album, Punica granatum,Rosa damascene, Cyperus longus, Pistacia lentiscus , Areca catechu, Aquilaria agalocha roxb, Eugenia caryophyllata,Terminalia chebula, Laurus camphora	halitosis , Dental weakness	The medications should be grinded ,sifted and mixed
Sanoon malek[G.S]	Commiphora myrrha Engl., Juniperus Sabina, Cupressus sempervirens,anacyclus pyrethrum	Toothache, halitosis	The medications should be grinded , sifted and mixed in equal amounts
Sanoon hafez sehat[G.S]	Peganum harmala, Cyperus longus, Valeriana officinalis,salt	teeth Health	The medications should be grinded ,sifted and mixed

Punica granatum

Equeous and ethanolic extracts of peel and seed of *pomegranatum* have demonstrated anticandidial effects and equeous extract has been more effective than ethanolic extract[13]. In another study it has been found that gel content pomegranatum seeds was as effective as chlorhexidine gel in prevention plaqe formation[14] and this can be linked to antibacterial and anti-inflammatory activity of pome granatum[15]. Equeous and ethanolic extract of *pomegranatum* is also effective in decreasing the entiretime of recurrent aphtus and this effect likely connectes to phenolic component[16]. Mouthrinsing content *chamomile* and *pomegranatum* extract have an important role in gingival bleeding reduction[17].

Terminalia chebula

The fruits of *terminalia chebula* are used in Iranian traditional oral dosage forms.studies have demonstrated that mouthrinsing content *terminalia chebula* are effective in reduction microbial plaques, gingival inflammation and nutrilizing salivary PH[18]. Nayak *et al* approved a reduction of 35-48% at salivary streptococos mutans content forming units at 60 minute after rinsing with ethanolic extract of terminalia chebula and streptococos mutans counts were low up to 6 hours post rinsing.(*Terminalia*[19]).The result of in vivo comparative study of *Emblica officinalis* and *Terminalia chebula* extract with chlorhexidine as an anti carries agent ,showed that the equeous herbal extract of *Terminalia chebula* and *Emblica officinalis* were more effective than chlorhexidine mouth wash,but with less time of action than chlorhexidine.(terminalia[20]).

Tamarix gallica

The fruits of this tree are used in the formulation of mouth and teeth Iranian traditional dosage forms. One species of *Tamarix (Tamarix boveana)* has shown anti oxidant and free radical scavenging activity.(*Tamarix*[21]).another species(tamarix aphylla)has antimicrobial potential of alkaloids and flavenoids extracted .(tamarix 4).it has also shown anti inflammatory and analgesic effects(*Tamarix*[23]).

Cyperus lungus

The rhizomes of *Cyperus lungus* are used in Iranian traditional medicine. Sesquiterpenoids extracted from a species of *Cyperus(Cyperus rotundus)*have shown anti hepatit B virus activity[24]. In an in vitro syudy methanolic extract of cyperus longus acts as analgesic substance[18].

Peganum harmala

Peganum harmala seeds, known as espand in Persian, are used in several sanoon formulations with different purposes such as dental and gum restoration, oral cavity disinfection, teeth whitening and aphthous stomatitis treatment[26]. The alkaloids constitute main phytochemicals of *Peganum harmala* seeds, specially harmaline and harmine which are toxic in nature.[27] The alkaloids are the origin of espand's antibacterial[28-29] antifungal, [20] antiparasidal[30] and insecticidal[27] activities. In one study the extract of its β-carboline alkaloids and chiefly harmine showed significant inhibitory effects against *Proteus vulgaris*, *Bacillus subtilis* and *Candida albicans*[28] In another study *Staphylococcus aureus*, *Saccharomyces cerievisae* and *E. coli* were much sensitive than other microorganisms to ethanolic extract of alkaloids.[29] Ethyl acetate extract of espand seeds exhibited significant analgesic and anti-inflammatory effects in compare with aspirin and diclofenac as standards in rats.[31] The anti-oxidant properties of *Peganum harmala* seeds, extracted with ethanolic, hydro-alcoholic and aqueous solvents, were determined by DPPH free radical scavenging method.[32]

Quercus Spp

Galls of Quercus spp. are kind of abnormal plant growth on leaves caused by certain insects. They are great source of polyphenol compounds called tannic acid.[33-34] gall (Afes) is used in sanoon formulation for treatment of weak gums and aphthous stomatitis[7] because of its high tannin content nutgall shows antibacterial, antiviral, antifungal, larvicidal, antioxidant and hepatoprotective affects. Antiviral properties of hydrolysable tannins against herpes simplex virus (HSV), human immunodeficiency virus (HIV) and leukemia virus has been demonstrated[35] Chursi S showed the abiity of methanol extract of Quercus infectoria nutgalls to destroy bacteria cell membrane

in methicillin-resistant Staphylococcus aureus infections.[28-29] Also the effectiveness of its ethanolic extract against a wide range of important bacteria has been studied.[30] Quercus infectoria nutgall extracts and fractions could properly control the Culex pipiens larvae[31] and fabrics treated with oak gall extracts showed high anticandidal effects.[32] Polyphenols in galls act as free radical scavengers and with antioxidant activity protect cell in oxidative stress conditions.[33-34] Besides, because of potent antioxidant and antiinflamatory effects of oak gall extracts they can be potentially used as hepatoprotective compounds[35-36].

Piper nigrum L

Fruits of black pepper have been used in sanoon formulations to fortify gum and teeth and modulate toothache.(Ref) Alkaloids, glycosides, terpenoids, steroids, flavonoids, tannins and saponins are phytochemical contents of *P. nigrum* fruits. The ethanolic extract of P. nigrum fruits was examined against several common microorganisms which cause infections in oral cavity. The results demonstrated high antimicrobial effects of extract against *Enterococcus faecalis, Lactobacillus acidophilus , Candida albicans* and *Candida tropicalis* compared to chlorhexidine as standard.[37] The anti-inflammatory properties of piperine, the main alkaloid of P. nigrum, investigated using carrageen-induced rat paw edema method. The prostaglandin release inhibition occured by administering 5 and 10 mg/kg of piperine to rats following by 1% of carrageenan.[38]further studies showed antipyretic activity of piperin in rats.[39] In addition, decreasing oxidative stress to the cells induced by a high-fat diet approved the anti-oxidant ability of piperine alkaloid.[40]

Rhus coriaria

Rhus coriaria with common name of sumac has been used in TPM for treatment of gums weakness, aphthous stomatitis and toothache.(Ref) Many phytochemicals such as tannins, (iso)flavonoids, terpenoids, etc are reported in sumac fruits.[41] The antimicrobial effects of *Rhus coriaria* water extract on food borne pathogens has been shown. Among these gram positive and gram negative bacterial strains, *Bacillus* species were most susceptible.[42] In other study its water extract possessed antibacterial activity against five common oral bacteria including four *streptococcus* species and *E. faecalis*. Besides, the extract inhibited the formation of bacterial biofilm on orthodontic wire.[43] Several phytochemicals showing antifungal activity are identified from ethanolic extract of sumac seeds.[44] The phenolic content of sumac comprising anthocyanins and hydrolysable tannins causes it to show strong antioxidant activity.[45] In one animal study rats with periodontitis were subjected to systemic administration of ethanolic extract of *Rhus coriaria* and reduction in alveolar bone loss by affecting receptor activator of nuclear factor-kappa B ligand(RANKL)/ osteoprotegerin(OPG) balance, total oxidant status(TOS) and oxidative stress index(OSI) levels were reported.[46]

Syzygium aromaticum (Eugeniacaryophyllata Thunb)

S. aromaticum with traditional name of gharanfol has been used in TPM for treatment of mental , respiratory, gastro intestinal,urinary tract disease, gums and dental weakness, halitosis. Saponins, tannins, phenols, cardiac glycoside, Anthracene, flavonoids and alkaloids are the main phytochemical compounds of Z. aromaticum flower. The antimicrobial effects of clove flower (Syzygium aromaticum) bud on dental pathogens has been shown in some studies[47- 48]. Aqueous extract of Cloves flower (S. aromaticum) has antimicrobial effect on gram positive,gram negative bacteria and fungi including Staphylococococcus epidermis, Escherichia coli, Proteus mirabilis, Klebsiella pnuemoniae, Aspergillus niger, Candida albicans, Rhizopus oryzae[47-49]. In other study,its aqueous extract had antimicrobial activity against some standard strains of food—borne pathogen bacteria(S. aureus, S. typhimurium and E. coli and normal ûora S. epidermidis and L. Plantarum)[50]. Other study revealed that Eugenia essential oil possessed an excellent antibacterial activity against oral streptococci including the cariogenic bacteria as well as an excellent antifungal activity[51]. In an in vitro study, the antioxidant activity of water and ethanol extracts of clove (Eugenia carophyllata) buds and lavender (Lavandula stoechas L.) against various antioxidant systems has been shown and compered [52]. Based on data obtained from other in vitro study, clove essential oil and its two active principle(eugenol and eugenyl-acetate) may positively affect the dental erosion

process of apple juice through distinct mechanisms. In this study, clove-oil-treated teeth showed decreased decalcification with respect to control[53]. In an in vivo study,Eugenia caryophyllata powder had anesthetic effect on a kind of fish (Huso Huso)[54]. Anti-inflammatory effects of eugenol nanoemulsion were shown in an animal model study.In this study, O/W nanoemulsion of eugenol was used in rats for the evaluation of anti-inflammatory effects as a topical delivery system[55.]

Anacyclus pyrethrum

The root of Anacyclus Pyrethrum has therapeutic effects. The compounds of this plant are Pyrethrine, resinous, pelletonin, tannin, gum, potassium sulfate and carbonate, potassium chloride,calcium phosphate, and carbonate. This plant has been used for treatment of neurologic, respiratory,dental , periodontal and gingival diseases, Stuttering and toothache in TPM[10-56] . In an in vitro study, methanolic extract of Anacyclus Pyrethrum root produced little antibacterial effect against Staphylococcus aureus and Streptococcus sanguis[57].

Rosa damascena

This plant has several compounds such as ter-penes, glycosides, flavonoids, and anthocyanins. The therapeutic uses of *R. damascena* in TPM include the treatment of abdominal, heart and lung diseases, menstrual bleeding, gums and dental weakness, halitosis , digestive problems the reduction of inflammation, coughing, thirst and wound healing[10-56].. In some animal Model studies, analgesic and anti-inflammatory effects of Rosa damascena hydroalcoholic extract has been shown [58-59].The effectiveness of mouthwash containing. Rosa damascena extract in the treatment of 50 patiant suffering recurrent aphthous stomatitis(comparing to the placebo) has been shown in a randomized, double-blinded, placebo-controlled clinical trial study[60].According to an in vitro study,the ethyl alcohol and acetone water extracts of R. damascene had antimicrobial effects against P.aueroginosa, C.albicans and E.coli. Among these microorganism, Pseudomonas.aueroginosa was the most susceptible[61].

CONCLUSION

Dental diseases are one of the major public health problems in the worldwide. Traditional Medical literature reviews shows that oral and dental health are important because there are separate chapters in the main TPM textbook about oral and dental care.This paper showed that sanoon is a specific dosage forms for the treatment of dental diseases with different type of medicinal plants in TPM and the general survey of pharmacological effects of these medicinal plants (*Punica granatum, Terminalia chebula, Tamarix gallica, Cyperus lungus, Quercus Spp, Piper nigrum L, Peganum harmala, Syzygium aromaticum(Eugenia caryophyllata Thunb) ,Rhus coriaria, Anacyclus pyrethrum ,Rosa damascene)* used in the multiple formulations of sanoon mentioned that these plants have different medicinal properties like antibacterial, antiviral, antifungal, antioxidant, gingival inflammation activity anti-inflammatory, antipyretic, analgesic, prevention plaqe, gingival bleeding reduction, anti aphtus and reduction microbial plaques.There fore,modern investigations confirmed the efficacy of some plants which have been traditionally used in Sanoon. Based on the results of the present study and according to the pharmacological characteristics of Sanoon, this dosage form may be useful in the treatment of dental diseases due to easier,specific and efficient delivary of drugs to the oral cavity by lower systemic side effects. We suggest making different Sanoon with efficient medicinal herbs to improve oral and dental health and eventually public health in the community.

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