

Zhumeria (Labiatae): anatomy, taxonomy and affinities

M.H. Bokhari & I.C. Hedge

Abstract

The monotypic Iranian *Zhumeria* (Labiatae) was investigated anatomically. The results, taken together with extra taxonomic information available as a result of recent collections, were used to assess its affinities. The conclusion reached was that although *Zhumeria* is a most distinct and isolated genus, it has some links with the genera of the tribe Meriandreae of the subfamily Stachyoideae. Drawings illustrate its characteristic anatomical and morphological features.

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تشریح ، طبقه بندی و پیوستگیهای *Zhumeria* (Labiatae)

از : ممتاز حسین بخاری وائین هج

خلاصه

گونه ایرانی و منحصر بفرد *Zhumeria* (Labiatae) از نظر تشریحی مورد مطالعه قرار گرفته .

نتایج حاصله از مطالعات تشریحی همراه با اطلاعات بیشتری در زمینه شناسائی از نمونههای جمع آوری شده جدید بدست آمده و برای تشخیص و تعیین پیوستگیهای آن استفاده گردیده است .

نتایج حاصله چنین است که *Zhumeria* یک جنس مجزا و جداگانه ای است ولی بعضی وابستگیهای باجنس رده Meriandreae و زیر تیره Stachyoideae دارد .

اشکال بدست آمده صفات تشریحی مشخص و بارزی را از نظر شکل شناسی و ترکیب، معین میسازد .

Introduction

Despite the fairly intensive collecting that has taken place in SW Asia during the last few decades, relatively few new genera, which could be described as remarkably distinct, have been discovered. *Physocardamum* HEDGE (Cruciferae from E Anatolia) and *Cryptocapnos* RECH. f. (Fumariaceae from SE Afghanistan) are two examples. A third is the subject of this note. The first herbarium specimens of it were collected by Miss MAJDA ZHUMER whilst travelling in southern Iran in 1966 as a member of the Norwegian Volunteer Service. It was subsequently described as a new genus and named in her honour by K.H. RECHINGER & P. WENDELBO. Since then some further gatherings have been made by staff at the botanical institutes of Ariamehr and Evin, all in the same general region as the original collection. The additional material enables us to give both a somewhat more complete morphological description and also to provide an account of its anatomy (M.H.B.); this is followed by an attempt to assess the taxonomic position of *Zhumeria*.

General description

Zhumeria RECH. f. & WENDELBO, *Nytt Mag. Bot.* 14: 39-43 (1967).

Z. majdae RECH. f. & WENDELBO, *l.c.*, 39, fig. 1,2. Fig. 1.

A much-branched, woody, lemon-scented, white canescent shrub up to c. 50 cm. Stem at base up to 5 cm diam. Internodes short, 5-17 mm. Leaves mostly towards ends of branches, crowded; densely canescent with dendroid glandular and eglandular hairs and sessile glands; lamina obovate to broad-elliptic, up to 20 x 14 mm, margin often strongly undulate, rounded at apex, cuneate below; petiole 1 (-2) mm. Flowers few, borne singly in the uppermost leaf axils. Bracteoles two, oblong-linear, c. 6 mm. Pedicels erect-spreading, 2-4 mm. Calyx 10-12 mm, ovate-campanulate, 5-nerved, with a \pm dense indumentum of dendroid hairs and of sessile glands, bilabiate, lips \pm diverging; upper lip with 2 oblong subapiculate lobes, c. 7 mm; lower lip with 3 subequal lobes 2-3 mm; after anthesis expanding to 20 x 20 mm, with widely di-

verging lips, membranous, often pale purplish coloured. Corolla violet to violet blue with a white tube and throat, c. 20 mm, indistinctly bilabiate, lips subequal, spreading to sub-reflexed; upper lip with two c. 5 mm broad, ovate lobes; lower lip with three \pm equal 4 mm lobes; tube included, straight, wide, densely annulate near middle. Stamens 4, exserted, attached near top of tube; anterior pair fertile, thecae large, curved, diverging occasionally unequal; posterior pair with much reduced or crumpled thecae not or scarcely fertile, somewhat shorter than anterior. Stigma shortly and \pm equally bilobed. Nutlets obovate-elliptic, weakly subtrigonal, c. 3.5 x 2.5 mm, pale brown, smooth, without reticulations, strongly mucilaginous on wetting; attachment scar very small. $2n=40$ or 42. Local name: Mohr-e khosh.

Type. Iran: Bandar Abbas, Gotbabad, c. 100 km N of Bandar Abbas, 800 m, 23.III.1966, ZHUMER 362, (holo. BG; iso. E!).

Iran. Bandar Abbas: E end of Kuh-e Genou, SW of Ab-e Garm, 250 m, 8.IV.1975, flowering, WENDELBO & FOROUGH 15731!; 22 km N of Qotbabad, S side of tunnel, 1250 m, 9.IV.1975, WENDELBO & FOROUGH 15793!; Bandar Abbas to Sirjan, Abé garmé Gueno, 11.III.1971, IRANSHAHR & TERME s.n.! Bandar Abbas to Sirjan, Tangué Zagh, 27.V.1971, fruiting, GHAZI s.n.!

Although the additional material has enabled some extra information to be given about the calyx, corolla and nutlets - relative to the original description, it is quite clear both that *Z. majdae* varies very little in its characteristics and also that it has a limited geographic range (Fig. 2) in the Saharo-Sindian region (Sudanian in the sense of ZOHARY) of southern Iran. Ecologically it grows on rather bare rocky slopes. Dr. WENDELBO has kindly supplied us with the following information on the *Zhumeria*-locality of Ab-e Garm situated at the western end of Kuh-e Genou, north of Bandar Abbas: scattered shrubs on a SSE-facing rocky slope (limestone), at about 250-300 m a. s. l.; together with plants like *Argyrolobium kotschyi* BOISS., *Blepharis persica* (BURM.) O. KUNTZE,



FIG. 1 *Zhumeria majdae*: a. Habit, x $\frac{3}{4}$; b. L.S. of corolla, x 2; c. Calyx opened out, x 2.5; d. Anther, x 8.5; e. Calyx after and before anthesis, x 1.2; f. Nutlet, x 6. GILLIAN MEADOWS del.

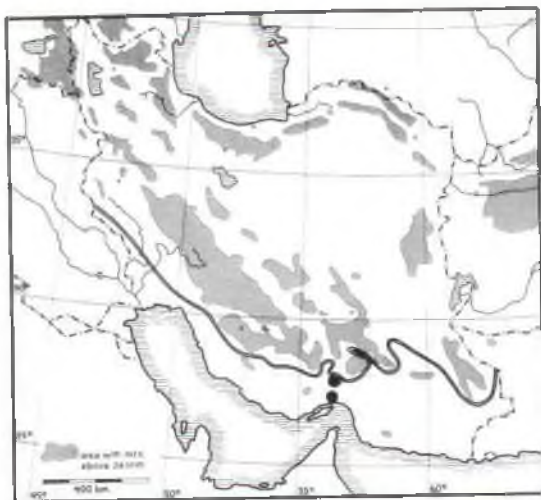


FIG. 2 Total known distribution of *Zhumeria majdae*. The double line indicates the northern border of the Saharo-Sindian region in Iran.

Convolvulus leptocladus BOISS., *C. spinosus* BURM., *Glossonema varians* (STOCKS) BENTH., *Gymnocarpus decander* FORSSK., *Helianthemum lippii* (L.) PERS., *Salvia aegyptica* L., *Viola cinerea* BOISS. and the three grasses *Chrysopogon aucheri* (BOISS.) STAPF, *Cymbopogon olivieri* (BOISS.) BOR, and *Tricholaena teneriffae* (L.f.) LINK.

Another interesting member of the Labiatae which grows in the same general area, north of Qotbabad, and close to stands of *Zhumeria* is the endemic *Salvia mirzayanii* RECH.f. & ESFANDIARI; its affinities are almost as problematical and unclear as those of *Zhumeria*.

Finally it is worth noting that according to WENDELBO & FOROUGHI the pleasantly lemon-scented dried leaves of "Mohr-e khosh" are sold in the bazaar at Bandar-Abbas; so although *Zhumeria* is new to botanists it is no novelty to the local populace! "Mohr-e khosh" may be translated as "the good plant."

Anatomy

Material and Method

This anatomical account is based on the study

of herbarium material kindly supplied by the herbarium of the Ariamehr Botanical Garden. The material was revived by the following technique. Leaf and stem material was soaked overnight in a 5% solution of KOH. Next morning the specimens were washed with water and then allowed to stand in water for a few hours; then after thoroughly washing with water the specimens were placed in F.A.A. for a day before section cutting. Hand sections were taken from the middle of the petiole and lamina through the midrib. Epidermal peels were removed by forceps from the upper and lower sides. Sections and epidermal peels were stained in safranin dissolved in 50% alcohol for 5 minutes; excess stain was removed with 50% acidified alcohol and after thoroughly dehydrating with absolute alcohol the sections and epidermal peels were mounted in euparal. Camera lucida drawings and slides are deposited in the Biology Dept. of Pahlavi University, Shiraz for future reference.

Leaf

Lamina and epidermis Epidermal cells are \pm barrel-shaped and are covered with a well-developed cuticle, which is corrugated in the midrib and petiolar region but quite smooth on the other part of the lamina. In face view, the epidermis cell walls are \pm smooth but heavily pitted. The leaf is isobilateral and amphistomatic. Diacytic stomata (Fig. 4C) are uniformly distributed and are in equal abundance on both surfaces of the leaf.

Mesophyll Mesophyll is clearly differentiated into palisade and spongy parenchyma tissues. Palisade cells are elongated ($2\frac{1}{2}$ times their breadth) and there are 2-3 layers of palisade on the upper and lower side of the leaf. The lower palisade continues into the flanks of the midrib and the upper palisade is arching over the bundle of the midrib (Fig. 3B). Spongy tissue is composed of isodiametric cells and is 2-3 cells in thickness.

Midrib There is a single collateral vascular bundle in the midrib having a group of collenchyma below the phloem. Callenchyma is also in two patches on the upper and lower side of the vascular bundle, just below the epidermis (Fig. 3B).

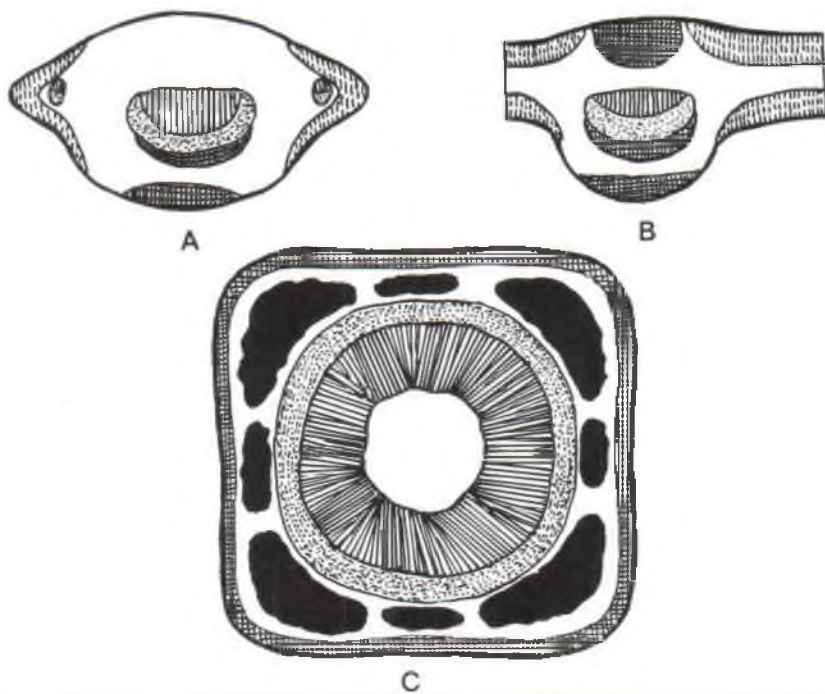


FIG. 3 Diagrammatic transverse sections of *Zhumeria majdae*. A. Transverse section of petiole; B. Transverse section of lamina through midrib; C. Transverse section of stem (All x 25). Sclerenchyma solid black; collenchyma cross hatched; chlorenchyma (palisade etc.) ticked; xylem hatched; phloem dotted.

Petiole

A transverse section of the petiole in the middle region shows that there are two distinct wings. In the petiole there is a single median collateral vascular bundle accompanied by two small accessory bundles in the two wings. There is a patch of collenchyma below the phloem of the median vascular bundle. A group of collenchyma on the upper and lower side of the petiole is also present. There is a well-developed chlorenchyma tissue in the wings and flanks of the petiole (Fig. 3A). The winged nature of the petiole has also been reported in some other genera of Labiatae (METCALF & CHALK 1950 and BOKHARI & HEDGE 1971).

Stem

The stem in a transverse section is \pm quadrangu-

lar (Fig. 3C). There is a continuous ring of 2-3 layers of collenchyma below the epidermis. Pericyclic fibers occur in strands which are much developed opposite the angles. Xylem form a continuous cylinder around the homogeneous pith and is traversed by very narrow rays. Phloem also occurs in the form of a continuous ring around the xylem. The pith is composed of lignified, pitted parenchyma.

Wood

Groundwork of wood is composed of thick-walled fibers with infrequent vessels which are either in \pm radial rows or in irregular clusters. Vessels have always oblique end wall and simple perforation. Rays are very narrow and are entirely composed of upright cells.

Indumentum

The occurrence together of diverse kinds of clothing hairs and characteristic stalked glands with uni- multicellular heads is a characteristic feature of the whole family. As far as we have been able to determine the diversity of trichomes which we report here for *Zhumeria* has not been recorded for any other genus of the family. Trichomes of various types are found on stem, petiole and lamina. The following account gives some idea of the diversity of indumentum types.

I. Non-glandular hairs These are the dominant types of hairs on all parts of the plant forming a dense tuft. They may be 1-2 celled simple hairs (Fig. 4 Aa, Ab), 2-6 branched multicellular hairs (Fig. 4 Ac-Af) and multicellular dendroid hairs which are profusely branched (Fig. 4 Ag). In fact there are all types of transitional forms between 2-branched hairs and dendroid hairs. The branched hairs are thick-walled and are distinctly articulated.

II. Glandular hairs These are more varied in form than the nonglandular types. They vary in the number of cells in the stalk; its length and number of cells in the head. The following types may be recognized.

A. Simple glandular hairs

1. Hairs with 1-celled stalk and 1-celled head (Fig. 4 Ba).
2. Hairs with 2-3-celled stalk and 1-celled head (Fig. 4 Bb, Bc).
3. Hairs with 1-celled stalk and 8-12-celled head. These glandular hairs are referred to as bladder-like integumental glands (SOLEREDER 1908 p. 638). In these glands the cuticle of the glandular head is raised like a bladder owing to the accumulation of secretion below the cuticle from the glandular cells (Fig. 4 Bd & 4C).
4. Hairs with 1-celled stalk and 2-celled head.

These are a rare type. There is no bladder like cuticular cover over the heads of these glands (Fig. 4 Be).

B. Branched glandular hairs

In the family Labiatae, multicellular, branched, glandular hairs have only been reported in *Meriandra strobilifera* (BOKHARI & HEDGE 1971). In the present study we have also recorded branched glandular hairs occurring on stem, petiole and lamina. Unlike the profusely branched, thick-walled and distinctly articulated glandular hairs of *Meriandra strobilifera*, the branched glandular hairs of *Zhumeria* are 2-5 branched, thin-walled and not clearly articulated (Fig. 4 Bf-Bj). Some of the branches have also been observed to be eglan-dular.

Taxonomic affinities and discussion

The original authors of the genus were unable to suggest even a broad affinity for *Zhumeria* and pointed out that it had so many anomalous features that using BRIQUET's account of the family in the *Pflanzenfamilien* (IV. 3a: 183-380, 1897) it was quite impossible to key it out. Although the new or additional information in this paper serves to confirm the isolated position of the genus, it is possible to make some suggestions about its broader affinities and, in particular, its links with BRIQUET's tribe Meriandreae. An anatomical-morphological review of the tribe's constituent members — *Dorystoechas*, *Meriandra* and *Perovskia* — was given in an earlier paper by the present authors (1971) and there are several reasons for linking *Zhumeria* with this group, even though it must be admitted that the Meriandreae is essentially an artificial assemblage of isolated relict genera united essentially only by the 2-staminate corollas.

In general facies, the clustered leaves, short internodes, the very simple form of the inflorescence, the calyx structure in flower and fruit, — *Zhumeria* has no similarity with any of the genera of the Meriandreae. It does, however, have the following features, unusual or rare in the family as a whole, in common with *Dorystoechas*, *Meriandra* or *Perovskia*.

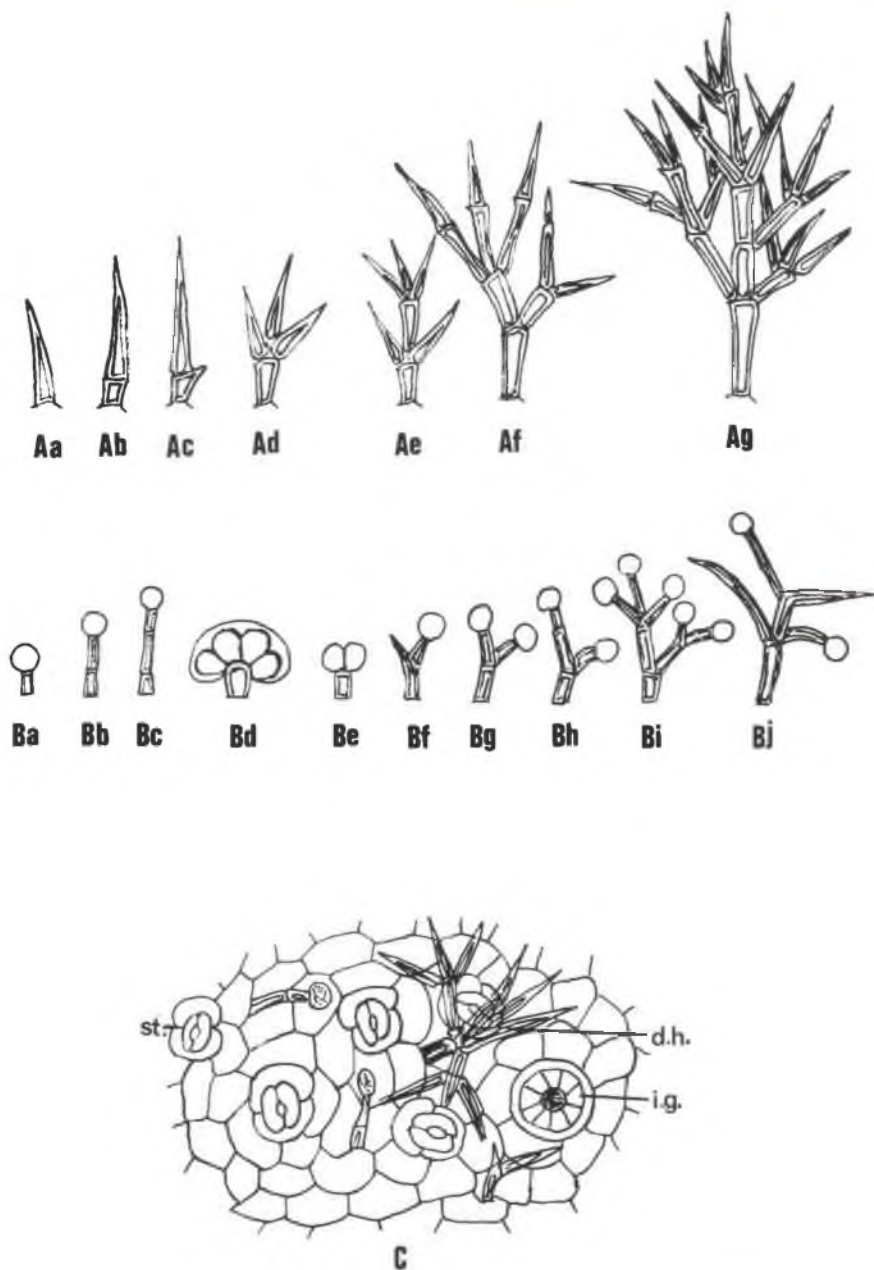


FIG. 4 Indumentum of *Zhumeria majdae*. Aa - Ag. Different types of eglandular hairs; Ba - Bj. Different types of glandular hairs; C. A portion of the epidermis showing stomata and trichomes (All $\times 90$)
d.h. = dendroid hair; i.g. = integumental glands; st. = stomata.

- a. An indistinctly bilabiate corolla, without a galeate upper lip, in which the lobes are subequal and spreading and an annulus is present in the tube. A similar form of corolla but very much smaller is found in *Meriandra bengalensis* BENTH. and *Perovskia* though in the latter the upper lip is 4-lobed.
- b. Two fertile, anterior, and exserted stamens in which the thecae are somewhat separated though without a distinct connective. A similar androecium is found in *Dorystoechas*, *Meriandra strobilifera* BENTH. and *Perovskia* but in these genera the posterior stamens are reduced to small inconspicuous staminodes whereas the posterior of *Zhumeria* are well-developed but functionally sterile or almost so.
- c. Branched glandular hairs. These were reported in our previous paper in *Meriandra strobilifera*; they appear to be very rare in the Labiatae.
- d. Profusely branched eglandular dendroid hairs. These also occur in *Perovskia* and *Meriandra bengalensis* and in various genera throughout the family.

The main difficulty in assessing the presented anatomical information about *Zhumeria* results from the absence of similar data in the family as a whole. The winged petioles of *Zhumeria* with a single median bundle and 2 accessory bundles in the wings (also found in *Perovskia*), the isobilateral leaves (also in *Perovskia*) and the uniseriate narrow rays and upright ray cells of the wood may be three anatomical features of importance but there is no means of knowing just how restricted or widespread they are in the Labiatae.

Geographically, the distribution of the genera is as follows: *Zhumeria* – restricted to S Iran; *Dorystoechas* – monotypic and restricted to a small area of the Mediterranean region of SW Anatolia; *Meriandra* – two species, one in Ethiopia, the other

Pl. 1 (opposite page) *Zhumeria majdae*. About 22 km N. of Qotbabad –near type locality – 1250 m. Photo P.W. 9th April, 1975.

in Kumaon, India; *Perovskia* – six or seven species in the arid regions of E Iran, Afghanistan, Soviet C Asia, Pakistan and Kashmir. There is no evidence of any existing affinity between *Zhumeria* and any Labiatae genera of Arabia or eastern Africa. What geographical links there are can only be found in other SW/C Asiatic genera.

The chromosome count of $2n = 40$ or 42^* appears to be an unusual one in the family but gives little suggestion of any possible affinity. Most of the genera with comparable numbers have, on morphological characters, nothing whatever to do with *Zhumeria*. However, it is of considerable interest that the only count available in the Meriandreae and reported here for the first time is that of *Perovskia* 'Blue Spire' (Edinburgh, C. 10588) in which $2n = 20^*$. For this we are indebted to CAROL MILNE and DOROTHY BRUNTON, Royal Botanic Garden, Edinburgh.

We previously pointed out (1971) that throughout the Labiatae there were some very natural groups of genera, (such as those centred on *Nepeta*) or individual genera (e.g. *Salvia* or *Scutellaria*), which were very difficult to relate with other genera and blend into any existing tribal hierarchy. Or, put another way, the natural groups in the family, at least amongst the vast subfamily Stachyoidae (to which *Zhumeria* belongs), are often either the individual genera or else supergenera (such as that of *Nepeta* and its close allies). It seems that although there are a few large groups (each with many genera and numerous species) – such as the subfamilies Prostantheroideae, Ajugoideae, Ocimoideae which are natural entities, there are a very considerable number of genera which cannot be fitted into a neat hierarchy. These are the genera, often isolated both taxonomically and geographically, which are so distinct that individually they are on the same level as the subfamilies cited above. That is, if one were to use the same objective criteria of character similarities and differences for recognition of subfamilies, the Labiatae would have a few subfamilies containing numerous taxa and a large number of subfamilies with few



or only one constituent species. But to raise, for example, such isolated, monotypic or oligotypic genera as *Dorystoechas*, *Zhumeria*, *Perovskia*, *Chamaesphacos*, *Hypogomphia* and *Zataria* to subfamily rank seems a rather negative approach and helps no-one in trying to understand relationships. The same problem, of course, occurs in almost all plant families of any size – and, indeed, in most large genera – but is one to which taxonomists have often given too little thought. There is, however, at least a case for arguing that it is better to fit these isolated genera into somewhat or clearly artificial groupings, (e.g. *Zhumeria* into the Meriandreae) rather than hasten to erect new monotypic

higher categories to accommodate them.

In conclusion it should be mentioned that *Zhumeria* has been successfully cultivated at the Göteborg Botanic Garden for the past few years and now appears on their seed-list.

References

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