

A NATURAL HYBRID OF
PHLOMIS PUNGENS AND *PH. BRACHYODON*

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ABSTRACT

Ten hybrid populations of *Phlomis pungens* and *Ph. brachyodon* were found in the area of Yattir (south of Hebron), on patches of deep soil uncultivated for over two decades. In many characters the hybrids are intermediates between their parents. Their complete sterility is apparently due to cytological and genetic factors.

Phlomis pungens Willd. and *Ph. brachyodon* (Boiss.) Zoh. belong to the subsections *Oxyphlomis* Bth. and *Gymnophlomis* Bth., respectively, of the section *Euphlomis* Bth. (Bentham, 1834). Both species are fairly common in Israel, the latter being endemic to Israel and Jordan. In Israel *Ph. brachyodon* is one of the major components of the dwarf shrub formation of the transitional steppe. It is restricted to the rocky slopes of the east Judean — Samarian ridges and the southern Hebron mountains. In contrast, *Ph. pungens* occupies deep alluvial soil in the northern part of the country, predominantly as a weed in cereal fields cultivated with ard (wingless plough). In the transitional steppe of the southern Hebron mountains, *Ph. pungens* occurs together with *Salvia syriaca*, *S. pinnata* and *Malvella sherardiana* in patches of deep soil, above 700 m. Although *Ph. pungens* and *Ph. brachyodon* differ markedly both morphologically and ecologically, they are capable of producing sterile F₁ hybrids. The present paper reports the discovery of populations of such hybrids and provides data on their morphology, ecology and cytology.

***Phlomis pungens* × *brachyodon* Danin et Ladizinsky, nov. hybr.**

Differt a *Ph. pungenti* basi caulis indurata, non herbacea, foliis indumento densiore, basi inaequilateris, non truncatis, aestate durantibus, bracteolis et dentibus calycinis brevioribus, corolla longiore, ante anthesin flava post anthesin violaceo-flava, non violacea. Differt a *Ph. brachyodonti* foliis indumento sparsiore, longioribus, basi inaequilateris, non cordatis, bracteolis et dentibus calycinis longioribus, corolla post anthesin violaceo-flava non flava. Plantae steriles.

Distribution and ecology. Ten hybrid populations of *Ph. pungens* and *Ph. brachyodon* were observed in a restricted area near Yattir (23 km south of Hebron).

There, 750–850 m above sea level, scattered *Ph. pungens* plants grow in wheat fields or in patches of deep soil ("brown grumosol", Dan and Raz, 1970) undisturbed for the past two decades. These fields are surrounded by rocky slopes covered with dwarf shrub formations of *Sarcopoterium spinosum* and *Ph. brachyodon*. The hybrids are confined to the patches of undisturbed deep soil where they grow intermixed with *Ph. pungens*.

Morphology. *Ph. pungens* and *Ph. brachyodon* differ conspicuously in morphology and habit, and especially in the pubescence of leaves and stems, leaf shape, length of calyx teeth, and shape and colour of the corolla (Table I and Fig. 1). In these characters the hybrid is intermediate between the parent species. Like *Ph. pungens* it grows in patches formed by subterranean stolons (such patches frequently reach 5 m in diameter). Unlike *Ph. pungens* stems which detach at maturity, those of the hybrid persist. In summer the hybrid produces typical small leaves as does *Ph. brachyodon*.

Two types of corolla colouration occur: upper lobe yellow, lower violet; upper lobe violet, lower yellow.

Cytology and fertility. The chromosome number of the hybrid is $2n=20$ as in both parents. Meiosis observed in 74 pollen mother cells (PMC) of the hybrid showed an average of 1.60 univalents, 9.03 bivalents, 0.01 trivalents and 0.06 quadrivalents (Fig. 2). About half of the PMC showed 10 bivalents. The hybrid is completely male sterile. The anthers were shrivelled and failed to dehisce. Eleven of the plants had only 0.15% stainable pollen. No viable seeds were found in over 3,000 fruiting calyces.

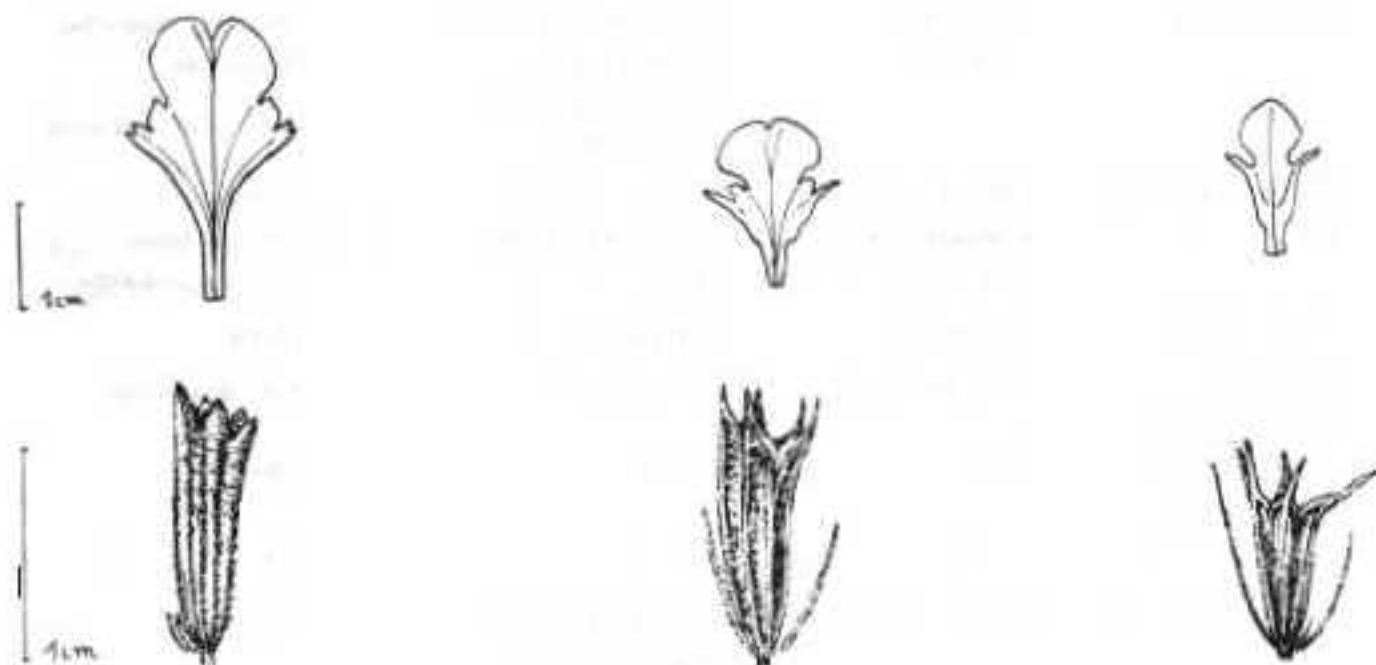


Fig. 1. Calyx (below) and lower corolla lip (above) of (from left to right) *Ph. brachyodon*, *Ph. pungens* × *brachyodon* and *Ph. pungens*.



Fig. 2. Meiotic metaphase in PMC of the natural hybrid *Phlomis pungens* × *brachyodon* (× 1200). Six univalents and 7 bivalents.

TABLE I
HABIT AND SOME MORPHOLOGICAL CHARACTERS OF *Ph. pungens*,
Ph. brachyodon AND *Ph. pungens* × *brachyodon*

Character	<i>Ph. pungens</i>	<i>Ph. pungens</i> × <i>brachyodon</i>	<i>Ph. brachyodon</i>
Habit	Growing in patches Dry stems detach	Growing in patches Dry stems persist	Dwarf shrub Dry stems persist
Indumentum	Appressed-tomentose	Appressed-tomentose in lower parts Woolly, flocculent in upper part	Woolly, somewhat flocculent
Shape and size of leaf	Oblong-lanceolate, truncate to attenuate base, 10-15 × 2-3 cm	Narrow-ovate with inequilateral base, 10-16 × 2-3 cm	Ovate-oblong, cordate base, 4-7 × 1.5-2 cm
Floral leaves	Lanceolate	Ovate-lanceolate	Ovate
Bracteoles	8-12, persistent	8-12, persistent	4-6, deciduous
Ratio length of bracteole/calyx	3/4-1	1/2-3/4	1/6-1/4
Ratio length of calyx teeth/tube	1/4-1/2	1/4-1/3	1/5
Colour of corolla	Violet at anthesis	Upper lobe yellow, lower pale violet Upper lobe pale violet, lower yellow	Yellow

DISCUSSION

Hybridization between species of the same subsection is apparently not rare in *Phlomis* (Rechinger, 1940). The hybrid described here is from species of different subsections which differ conspicuously both morphologically and ecologically. The 10 hybrid populations, each consisting of many individuals, indicate extensive hybridization between *Ph. pungens* and *Ph. brachyodon*. As noted, all hybrids grow intermixed with colonies of *Ph. pungens*, but it is not clear whether this is due to the fact that *Ph. pungens* serves as the female parent, or that the hybrid is incapable of surviving in the rocky habitat occupied by *Ph. brachyodon*. In this context, it should be borne in mind that the hybrid is confined to patches of deep soil which has lain fallow for several years, but does not grow in adjacent ploughed wheat fields. Thus, it appears that the hybrid is a less successful weed than *Ph. pungens*. As in many interspecific hybrids, the range of ecological conditions in which the present hybrid is able to survive is apparently very limited and coincides with conditions prevailing in temporary habitats. The relatively great number of PMC with 10 bivalents indicates that, in the present case, sterility is not entirely the result of a disturbance in meiosis but is also due to genetic factors.

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REFERENCES

- BENTHAM, G. 1834. Labiatarum Genera et Species. London, pp. 621-22.
 DAN, J. AND Z. RAZ. 1970. Soil Association Map of Israel. Israel Ministry of Agriculture (in Hebrew).
 RECHINGER, K. H. 1940. Kritische Revision von *Phlomis* Sect. *Gymnophlomis* Benth. Öst. bot. Z. 89: 257-299.