Palestinian plants, their biology, diseases and cryptogamic inhabitants.

BULLETIN 8.

I. Asphodeus microcarpus Viv.

by

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(With 16 Text Figures).

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1. NAME.

There is no doubt that the *Asphodelus* which is one of the commonest plants of Palestine had a name of its own in biblic times. Dalman (1) seems to be right in stating that the „Havazeleth" of the Bible served as a name to this plant as well. The Arabs distinguish today in Palestine between the Buślan rafi (narrow leaved — *Asphodelus microcarpus* Viv.) and the Buślan 'arid (the large leaved — *Urginea maritima,* L.) which are met often together and predominate over large areas in Palestine. In the name buślan as well as in its other names now in use by the Arabs as ruślan, huślan, 'ansal there is no doubt to be found a reminescence of the biblic havazeleth. It should be added here that havazeleth is now in use in the spoken Hebrew for *Pancratium maritimum* L.

There are at present two names in use for the Hebrew designation of the plant: Netz Halav and 'Irith. The first one was introduced by Rubinovitz (2) but is now being discarded in favor of the second name 'Irith which seems to be the correct one as discussed and fully cleared up by the author in Bulletin 7 of the Independent Biological Laboratories (3).

2. DISPERSION.

Asphodelus microcarpus Viv. *(Liliaceae)* (Fig. 45) is to be found in all Mediterranean countries. It serves in the Odyssey as refuge to the souls of the dead as it covers in great numbers the cemeteries. It is common in our country and one of the most typical in our flora. It is met in groups covering large areas, but it grows also singly quite often. It is to be found in all zones of the country: n the Shefela and Sharon except on the moving sand dunes, it covers the slopes of hills, it climbs the mountains, passes the Jordan and penetrates in the desert to the East and South. It succeeds thus in all kinds of soils, heavy ones as well as light ones, but the environment influences as much its external aspect as its biology, as will be iaken ud later on more in detail.

Fig. 45

3. DESCRIPTION.

The roots (Fig. 46) are thick clustered gibbous tubers 10—20 cms. long and 1—2 cms. thick, they penetrate the soil to a depth of not more than 10—15 cms. The rhizom creeps in the soil to a distance of some 20—30 cms; its neck is surrounded by bristly fibers. The leaves of the plant cluster at its base near the ground, they are folded along the middle nerve, triquetrous in shape; 50—100 cms. long, 1—2 cms. broad, tapering at the tip. The scape (Figs. 47, 48) is one or many, terete, leafless, solid, one meter or more high, The infloresence is a panicled raceme. All flowers do not open synchronously, at first opens a single flower in each spikelet, and their number increases gradually. The pedicels are

erect, shorter than flowers, articulated at their lower third part. The young flowers are folded and the perigonium covers the inner parts; when fully developed they remain widely open and do not close even in raining days. Mr. Zohari of the Hebrew University at Jerusalem tells me they close before dawn, but I was unable to corroborate this observation.

Fig. 46

The white flower (Fig. 49) is very rich in nectar. The funnel-shaped perigonium is widely spreading, regular and 1—2 cms wide, divides into six equal divisions connate at their base. The divisions are oblong obtuse wth a reddish or greenish keel, agreen stripe is to be seen at the outer side of every one of them. The concave filaments are dilated at their base, they surround the ovary, then become filiform and ascending. The equal anthers are fixed by the middle of their back, they are oblong and grooved longitudinally. The ovary is three celled with two ovules in each cell; the style is filiform, the stigma is capitate; the fruit stem is articulated. The fruit capsule (Fig. 50) is leathery obovate, loculicidally three valved, 8 mms. long. The seeds are one or two in each cell placed longitudinally, greyish black, acutely triquetrous, one or two grooves passing at their back.

4. LIFE HISTORY.

Plants growing on mountains differ in their shape widely from those in valleys. The leaves are much narrower of those in the mountains and the whole plant makes the impression as if it were less developped and as if it were growing in adverse conditions; it never forms there the thick typical tubers as in the valley, the sprouting of the leaves is also much retarded in some places.

The leaves sprout at the beginning of November with the first rainfall, but in heavy soils and shadowy mountain places they come out as late as December. They start shriveling at the end of April.

The new roots appear at the end of January and at the beginning of February, at a much more regular rate and fixed time than the sprouting of the leaves. The tubers store food during winter, rest during summer, provide food to the new plant at the beginning of

Fig. 47

Fig. 48

Fig. 49

Fig. 50

Fig. 51

winter, empty gradually and dry out in January at the time of the appearance of new roots. It flowers at the beginning of February and sets fruits at the beginning of March.

It became clear during the years of observation that there are years of rich blossoming in comparison with years of poor blossoming. This is caused evidently to some degree by diseases and pests attacking the plant, but there might also be some periodicity in the life of the plant itself, our observations showed rich blossoming in the years: 1927, 1929, 1931 and poor one in the years: 1928, 1930, 1932.

The *Asphodelus* responds readily to environmental conditions: humidity, heat and quality of soil, which influence also no doubt much the mentioned periodicity in its life. When one passes the

country in length or breadth one sees very striking differences in the rate of development of the different plants from place to place. It happens that such differences can be seen even on plants growing on the different slopes of the same hill. In the vicinity of the desert there are years in which it does not sprout altogether and its tubers remain resting in the ground during two years or even more, there are also years when leaves sprout but the plant does not come up to blossom; all this depends on the quantity of rain in the given year.

5. USE OF THE PLANT.

The tubers of the *Asphodel* served as food to the poor in Greece according to Theophrastrus and even to kings according to Hesiod. It served as cattle food in Greece and Syria which is mentioned also in Hebrew ancient literature (3), but it is not liked by the shepherds as the cattle never tastes its leaves, they eat willingly only the tubers of the plant what requires special preparation as pulling out in summer. In France alcohol was produced from the pressed juice of its tubers (4); from a hundred liters of pressed juice there were obtained some eight liters of 66-grade alcohol of good taste. The tubers served also for the preparation of paste which whithstands very well worms, a fact wich was known to the ancients and served as origin to the Hebrew name of the plant. The tubers are dried for this purpose, ground to a powder and the necessary amount of water is added. This paste served shoemakers, cobblers and bookbinders. Plinius (5), Geoponica (6) and others relate that the tubers of the plant protect from the venom of snakes and scorpions. The source of this tradition is Syria and it is also conserved in the Hebrew ancient literature.

Its danger as weed is very little as it is pulled out easily even by the wooden plow of the Arabs owing to its shallow growth. In the arab fields one can often see outrooted rhizomes which continue their growth as long as the stored contents of humidity and food lasts and shrivel after a fairly long time or succeed to strike new roots in the ground.

6. INTERNAL ANATOMY.

The epidermis of the leaf (Fig. 52) is one layered except at its edges where it becomes many layered. The palisade parenchyma

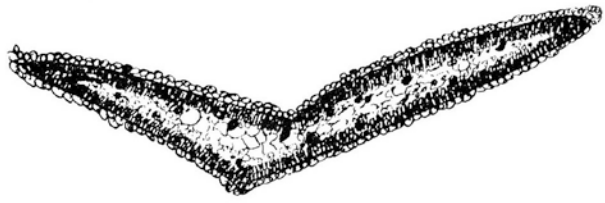

Fig. 52

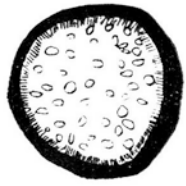

Fig. 53

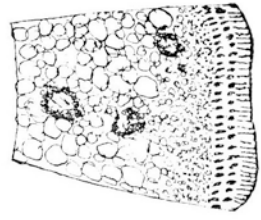

Fig. 54

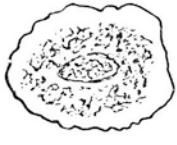

Fig. 55

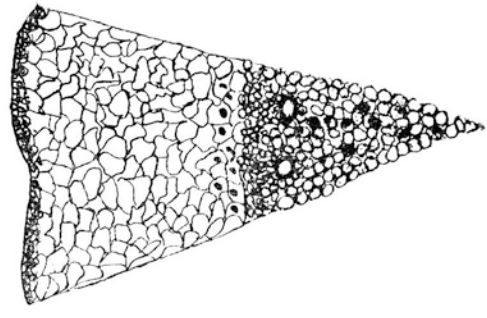

Fig. 56

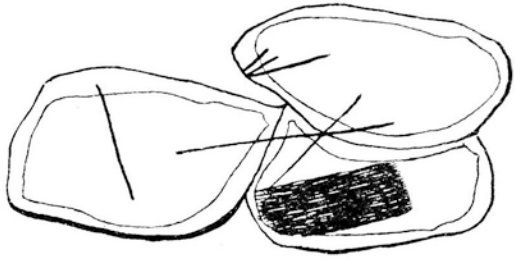

Fig. 57

is two layered on the upper as well as on the lower surface of the leaf. The spongy parenchyma is little. The fiber bundles are dispersed equally on both sides of the leaves. They are to be found near the palisade parenchyma on the border of the spongy parenchyma which occupies the center of the leaf. The fiber bundles of the opposite sides of the leaf are grouped at its base one opposite the other and almost touch so as to form partitions of bundles passing transversally. The phloem is to be found on the inner side of the bundles and the xylem at its outer side, the cambium is placed inbetween them.

The scape (Figs. 53, 54) is surrounded by two layers of parenchyma full of chlorophyll; the fiber bundles are dispersed all through the scape. The parenchyma of the central cylinder is made up of rounded or edged cells, the surrounding cambium of small round ones.

The fiber bundles are grouped in circles in the root (Fig. 55, 56). The xylem fibers are very large proportionally. The pericycle parenchyma is made up of large rounded or edged cells; the central cylinder of small round ones. The root as well as the rhizom include a large number of crystals of different kinds to be found in the form of single needles or bunches of them (Fig. 57).

7. CRYPTOGAMIC INHABITANTS AND DISEASES.

a. *Puccinia asphodeli* Moug. (Figs. 58, 59, 60).

Plants collected 1.23.29 at Sheikh-Muannes in heavy and low soil were found to be heavily infected by *Puccinia asphodeli* Moug. The Telia of the rust are equally distributed upon both sides of the leaves, they are elipsoid and more or less oblong. The walls of the pustules are perpendicular; the pustules themselves flatten at their upper smooth surface. The telium bursts at ripening in a longitudinal groove. Telia often agregate and cover large areas of the leaves which turn dark brown around them. The telium is gray brown with a golden luster. It is 1—3 mms. long, 0,8 mms. wide and 0.4 ms. high at its ripening time before bursting. The upper cover of the telium seems to be made up of one the palisade layers of the leaf and its epidermis. The teleutospore is round somewhat eliptical two celled, the cells are separated one from the other by a transversal partition and the outer wall is slightly constricted at this partition. The spore is surrounded by a gelatinous

substance borded by the outer wall. The inner cell is yellowish brown, its wall is dark brown, the gelatinous substance is greenish yellow. Each cell is provided with two pores at the side opposite

Fig. 58

Fig. 59

Fig. 60

o the partition. The spore is 43 μ long and 34 μ wide; the outert wall is 1,5 μ thick; the inner cells are each one 24 μ long and 16 μ wide.

b. *Stripe disease.*

Is to be found all over the country, collected at Ness - Zionah 11.1.31. Small dark brown somewhat elliptical spots collect in stripes and cover almost the whole leaf from both sides. The attacked leaf turns brown. Leaf sections showed included bodies of a fixed shape; their nature is not cleared up as yet.

c. *Scape blackening.*

Is to be found all over the country; collected at Shechunath Boruchov 3.10.30 and at Ness Zionah 23.1.31. The scape blackens, does not reach its full development, twists and dessicates; in case it succeeds to attain the blossoming period, the flowers blacken and crumble. The extend of the disease changes from year to year due apparently to the influence of climatic conditions. The cause of the disease is not cleared up as yet. Sections showed no special bodies in the tissues of the plant, the fiber bundles were found to be blocked with some gummy deposit. It might well be that the two discused diseases are interrelated.

ACKNOWLEDGMENT.

This opportunity is gladly taken to express deepest indebtedness to Dr. D. Scheinkin of the Independent Biological Laboratories, Tel-Aviv, Palestine and to the Imperial Mycological Institute, London, England for different help rendered to the author.

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LITERATURE CITED.

1. Dalman, P.: Arbeit und Sitte in Palaestina, C. Bertelsmann in Guetersloh. 1928.
2. Roubinovitch, E.: Dictionnaire latin-arab-hebreu. Jerusalem.
3. Carmin, Jos.: 'Irith, Asphodelus microcarpus Viv. Bull. 3; 15 April, 1932. Indep. Biol. Labs. Tel-Aviv, Palestine (in Hebrew).
4. Bolshaja Enciklopedia, sixth edition, Tovariszczestwo Prosveszczenia in St. Petersburg (in Russian).
5. Plinius: 22, 32, 67.
6. Geoponica: 19, 6, 7.
7. Carmin, Jos.: The Fauna of Palestinian Plants I. Asphodelus microcarpus, Viv. Bull de la Soc. R. Entomol. d'Egypte. N. S. 1928: 64—77
8. Carmin, Jos.: The Fauna of Palestinian Plants I. Asphodelus microcarpus Viv. addenda. Bull de la Soc. R. Entomol. d'Egypt N. S. 1930: 57-59.
9. Carmin, Jos.: The Fauna of Palestinian Plants I. Asphodelus microcarpus Viv. second addenda (in print).

SUMMARY.

1. The Hebrew name of the *Asphodelus microcarpus* Viv, is discussed and found to be 'Irith.
2. It grows all over Palestine, mountains and valleys and penetrates into the desert.
3. A full description of the plant is given.
4. Its life history is taken up: leaves sprout at the beginning of November soon after the first rains are over and dessicate at the end of April with the start of the summer. New roots appear at the end of January or at the beginning of February and shrivel in January next year.
5. The life history of the leaves shows a much closer coincidence with environmental conditions than the one of the roots.
6. There is found to exist a periodocity in the life of Asphodelus; years of rich blossoming interchange with ones of poor one.
7. The different uses of the plant are taken up as food for man and cattle, fabrication of alcohol and paste.
8. Its place in the folklore of different nations is related.
9. The internal anatomy is taken up in detail.
10. Of cryptogamic inhabitants *Puccinia asphodeli* Moug. is reported which is fully described
11. Two diseases were found to attack the plant: a stripe disease and a blackening of the scape both of them are discussed and their interrelation is suggested.

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