GERMINATION, INVASION OF OROBANCHE CERNUA LOEFL. AND ITS DEVELOPMENT ON A ROOTS OF HELIANTHUS ANNUUS L.

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Summary.

The excretion from a roots of host-plants is, as it is known, a trigger's mechanism of the germination of broomrapes. There is the special cellular centre in endosperm of seed of Orobanche cernua Loefl., which have part in initiation of the germination and in regulation of process of the grouth of germ. This centre consist of cells of an aleuronic layer of endosperm and is situated in micropilar zone of its. More high like activity of an endosperm is in Balanophora (Shivamurthy, Arecal, Swamy, 1981).

The attach of the germ of O. cernua to the root of sunflower take place with help a slime. This slime excrete from cells apical zone of the germ-tube of O. cernua. This let us come to conclusion, what the invasion of broomrape to the root of sunflower is a special chemical process.

A germs of O. cernua on a roots of sunflower have two possible ways of development. The first is a development with metamorphosis of organization a tubercle-like germ. The second is a development with redifferentiation of terminal (epicotilar, haustorial) zone of the embryo. The first a way is usual for broomrapes, which parasite on a perennial of fost-plants. The other way is a secondary adaptation to parasitism on annual plants (like sunflower).

Introduction

Ontogeny and germination of Orobanche cernua Loefl. is do not study inough in order to deep understand of biological nature this parasitic plant and its interrelations with Helianthus annuus L. We discovered three new phenomens in process of the investigation of O. cernua, which can be useful for to create effective methods of struggle with this weed parasite.

The germination of O. cernua and other broomrapes are donor-depending process, as it is known. The trigger for germination of these parasites is a chemical root-exudates going out from roots host-plants.

Materials and Methods

Seeds of Orobanche cernua Loefl. and Helia nthus annuus L. were collected in agrucultural fields in vazious parts of Krasnodas district (Russia). Germination studies on method A.Kadry a. H.Tewfic (1956). Stages of germs of parasite after fixation the material was transferred to and kept in 70% ethanol. Than the material was dehydr ted in alcohol series to absolute ethanol and embedded in paraphin with help hlorophorm, 8 - 10 μm sectioned, and stained with gentian-violett with orange G.

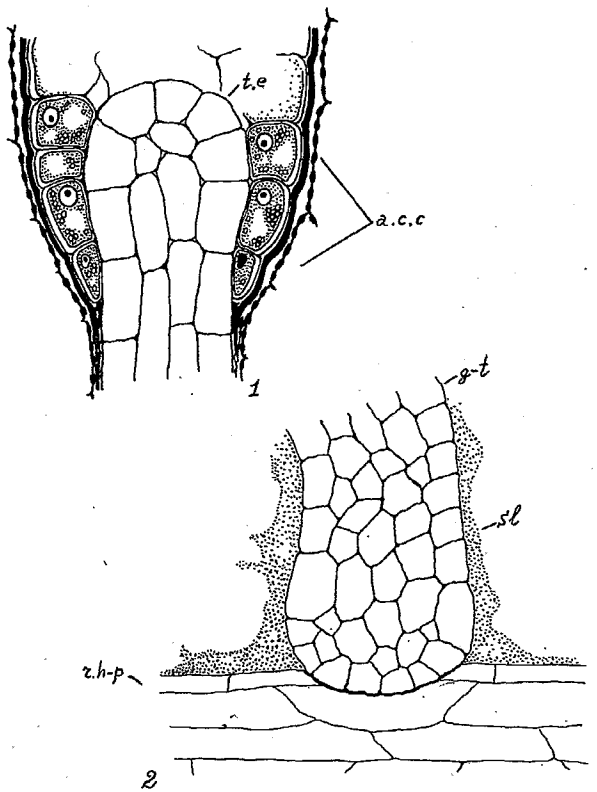
Results

The chemical stumulator come to seed O. cernua through micropile. There is the special cellular centre in endosperm of seed of O. cernua, which have pa t in initiation of the germination and in regulation of process of the grouth of germ. This centre consist of from cells of aleuronic layer of endosperm and is situated in micropilar zone of its (Fig.1). More high activity of an endosperm is in Balanophora (Shivamurthy, Arecal, Swamy, 1981). The activity these cells display with beginning of the germination of embryo O. cernua. I think, the activity of these cells of aluronic layer stimulate the germination of the embryo and regulate the grouth of its. The cells of activity centre remain alive long time in the course of the germination, when other cells of the endosperm are died.

The germ-tube of O. cernua grouth in direction of the root of host-plant (sunflower). When the apex of the germ-tube will touch to epidermis of the root of host-plant, the cells of apical epidermis of the germ-tube begin to exudate the slime. This slime attach of the germ-tube to the root of the host-plant (Fig.2). It is necessity to study the chemical content of this slime in order to investigate possibility of influence on it.

L.Koch (1887) studied the development of the germs in Orobanche minor, O. hederae, O. crenata and Phelipanche ramosa. He came to conclusion what the germs of these species of broomrapes have two ways of development : bipolar (like of germs of antotrophic plants) and development of tubercle with forming in it adventive shoot apex of generative offshoot. Such transition from unipolar development of germ-tube to bipolar development (adventiv shoot - hanstorium) when tubercle preparing for sexual reprodiction we called "development with metamorhosis of the organization" (Teryokhin, 1968; Teryokhin, Nikiticheva, 1968). O. cernua have two modes of ontogeny too (Teryokhin, 1976; Teryokhin, Anisimova, 1978). The development with metamorphosis have place in O. cernua, when this plant parasite on roots of perennial species of Artemisia. When O. cernua parasite on roots annuual H. annuus, it have two ways of development of germs. One part of the population of seeds have development with metamorphosis (if seed is far sitiated from root of host-plant and other part — stright bipolar way (but do not like of bipolar developmentof autotrophic plants) (Fig. 3 -6).

Broomrapes have very reduce embryos without apex of shoot, cotyledones and radicula. In first time of the germination "shoot" zone of reduced embryo carry out hawstorial function in endosperm of seed. After redifferentiation this zone become the shoot apex like shoot apex of au-to-trophic plants, without cotiledones (but with reduced leaves). The "stight bipolar way' development of the embryo of O. cernua is a secondary adaptation to parasitism on annuual plants (like sunflower).



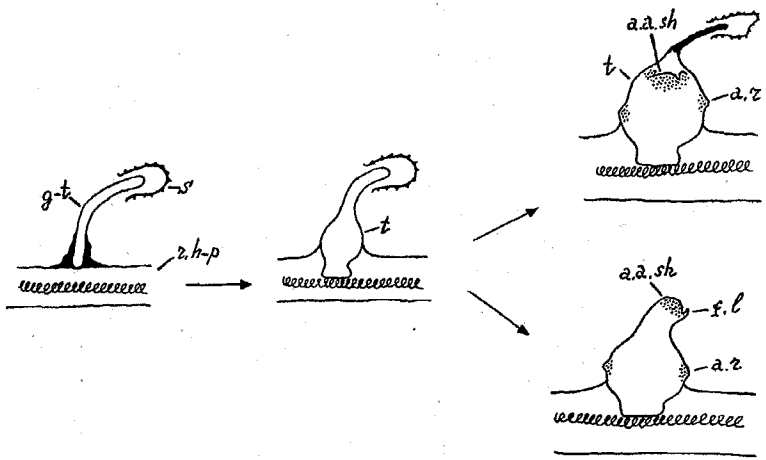


Fig.1. Micropilar zone of seed of Orobanche cernua in time of germination. a.c.c - active cellular's centre, t.e - top of germinating's embryo,

Fig.2. The germ of Orobanche cernua in contact with root of host-plant. g.t - germ-tube of parasite, sl - slime, r.h-p - root of host-plant.

Fig. 3 - 6. Development of the germ of Orobanche cernua with metamorphosis (3,4,5) and "strght bipolar development" (3,4,6). a.a.sh - adventive apex of shoot, a.r - adventive root of parasite, g-t - germ-tube of parasite, f.l - first leaf, r. h-p - root of host-plant, s - seed, t - tubercle.

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