These differences in P/O ratio were more pronounced between *Phaseolus mungo*, *Phaseolus radiatta* and their related wild species, namely, *Phaseolus otropurpureus*, *Phaselous trilobus* and *Phaseolus panduratus*, but, to a lesser extent with *Phaseolus calcaratus* a semi-domesticate species. The same trend exists between the domesticate and wild species of *Vigna*.

Soybean, *Glycine max*, where, recently introduced and highly domesticate varieties and land race material exist, again showed that the land race, Black Kulti, had a P/O ratio twice that of the variety, Jupitore.

The number of pollen grain per anther and the P/O ratio has so far drawn only passing references without any significance to the role it has played in shaping the reproductive strategy of a crop plant[4]. Though there may not, at present, be a strong evidence to assign risk continuums for the species based on their being wild or domesticated, it may be said that there does exists *prima facie* a strong correlation between the reproductive effort of species (measured by pollen number per anther) and P/O ratio.

The significance of the energy budgeting in a species between its vegetative and reproductive parts have been discussed in detail by Calow[4]. In an obvious step, which Maynard Smith[5] further attempts, the reproductive energy could be split into male and female gametes. The allocation of more energy in the wild types for a larger pollen production and hence a greater P/O ratio, needed essentially to cope with the risk factors in the process of pollination and fertilization, is cut down drastically in the domesticated types as evident from this study. Follow-up studies on the mechanisms of such evolutionary changes may have many interesting implications relevant to crop adaptive strategies.

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DEVELOPMENT OF INFECTION STRUCTURE BY UREDOSPORES OF *PUCCINIA RUELLIAE* (BERK. AND BR.) LAGERH.

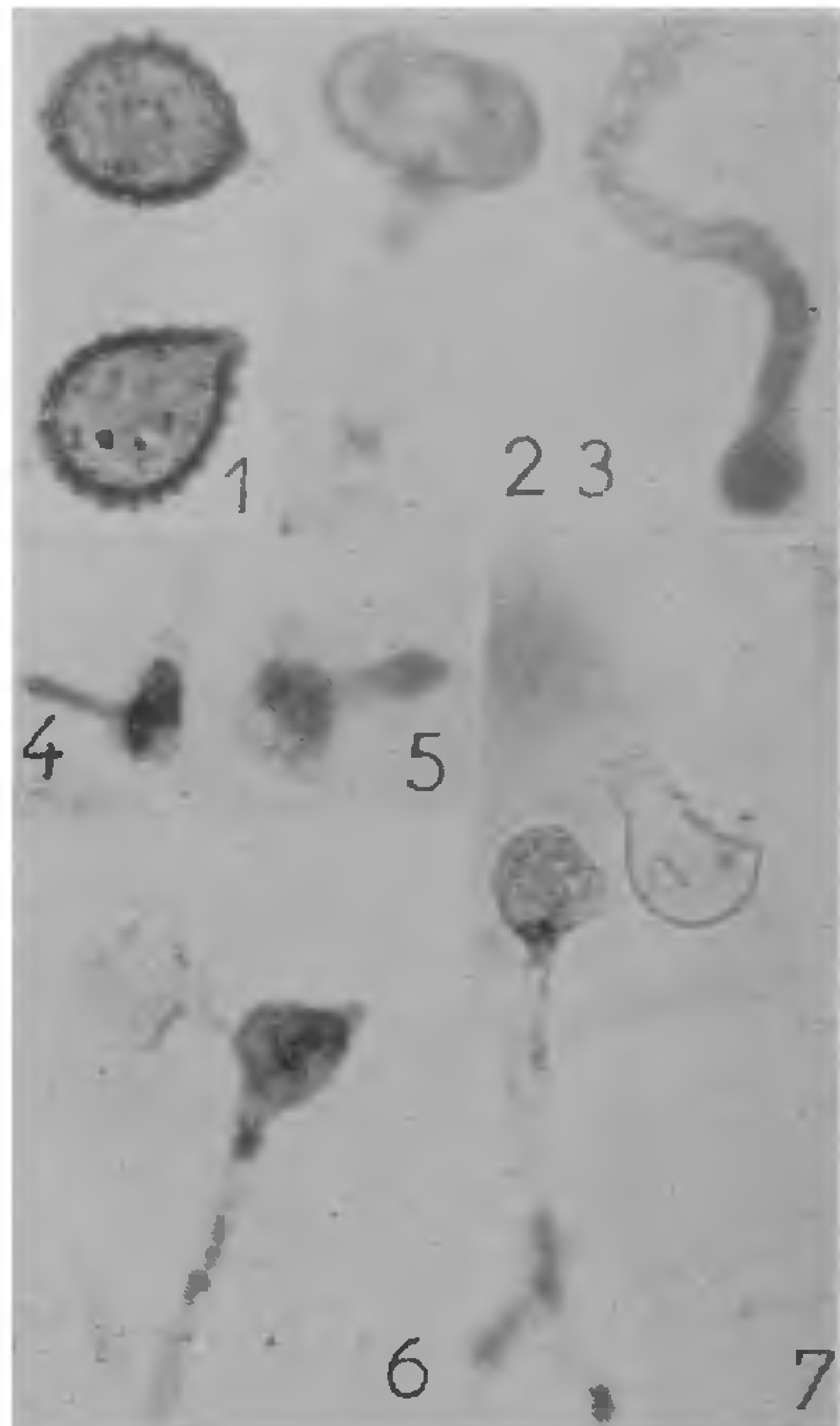
Uredospores of *Puccinia ruelliae* (Berk. and Br.) Lagerh. were germinated in tap water by De and Roy[1]; but they did not observe differentiation of the germ tubes. The present study deals with the effects of some environmental factors on the development of infection structure by germinated uredospores of *P. ruelliae*.

The uredospores were scraped from the freshly collected infected leaves of *Ruellia prostrata* Lamk. and allowed to germinate in tap water on glass slides at 20° C following the method of De and Roy[1]. The germination occurred within 24 hours. The germinated uredospores were then transferred to tap water of different pH, varying from 2·5 to 7·5 (adjusted with normal NaOH or HCl at 0·5 unit increment) at 10° C, 14° C, 27° C and 30° C under 0, 6, 12, 18 and 24 hours of light (intensity 1,000 lux).

The uredospores are thick-walled, echinulate and yellowish brown in colour (Fig. 1). Only one germ tube was produced by a spore (Fig. 2). The germ tubes tolerated the entire pH range for their differentiation but temperature and photoperiod greatly affected it. Infection structure developed at 20° C and 27° C when the light period was followed by 12 to 18 hours of darkness. No infection structure occurred in complete darkness or in continuous illumination. Under these conditions, the germ tubes merely elongated into long (up to 5,000 μ), unbranched, aseptate hyphae which ultimately withered away. Optimal appresorial formation was induced by exposing the germinating spores to six hours of light at 20° C in water of pH 5·5 and in this optimal condition, 72% of the germinated spores formed infection structures.

Prior to differentiation, the germ tube extended into long, unbranched, aseptate hypha with rounded apical end, the protoplasm occupying a relatively constant volume at the tip of the germ tube, while the rest of the hypha remained almost vacuolated. After attaining a length of 3,000 μ, the germ tube ceased its forward growth and its apical end began to enlarge to form an appresorium. The protoplasm which moved into the developing appresorium was eventually isolated from the rest of the germ tube by a septum (Fig. 3). Then an infection peg began to develop from the appresorium (Fig. 4) within 4 5 hours and its tip started to swell to form the substomatal vesicle (Fig. 5). Soon the protoplasm migrated from the appresorium through the infection peg into the vesicle and shortly after the completion of this migration of protoplasm, a septum was formed between the vesicle and the infection peg. Subsequently, a single unbranched, aseptate infection hypha developed from

this vesicle (Figs. 6, 7); but this was never over 70 μ in length. The germ tubes required an incubation period of 18 to 24 hours for complete development of the infection structure. Unfortunately, the infection structure could in no condition be induced to develop further.



FIGS. 1-7. Fig. 1. Uredospores. Fig. 2. Germinated uredospore. Fig. 3. Germ tube showing appresorium at its apical end. Fig. 4. Development of infection peg from the appresorium. Fig. 5. Development of substomatal vesicle at the tip of the infection peg. Figs. 6 and 7. Fully developed infection structures showing appresoria, infection pegs, substomatal vesicles and infection hyphae.

The development of infection structure described above essentialy resembles the mode of development of similar structure observed earlier by Maheshwari *et al.*[5]. The uredospores of *Puccinia ruelliae* germinated and formed infection structure satisfactorily in water on glass slides, and for this purpose no host stimulus or nutrient was required. This observation, therefore, contradicts the report of Hurd-Karrer and Rodenhiser[4] who noted infection structure development only in the presence of nutriemts. On the other hand, Dickinson[2,3] emphasized the importance of physical contact in exciting rust spores to form appresoria. But in the present study germ tube differentiation was found to depend on photoperiod, temperature and pH of water, irrespective of any particular contact stimulus.

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EFFECTS OF SIMAZINE ON DNA, RNA AND TOTAL NITROGEN OF PEAS (*PISUM SATIVUM* L.)

SIMAZINE (2-chloro-4-6bis (ethylamino)-S-triazine, a pre-emergence herbicide, used to control weeds in many agronomical and horticultural crops[1,2], has been shown to influence the seed weight, crop yield, total amino acids and protein contents of the treated crop plants in the first and second generations[3-5]. In some cases, the high protein content attributed to herbicidal treatment was only due to supplemental nitrate fertilization without a change in the dry weight of the treated plants[6]. We have studied the effect of Simazine treatments on peas that do not require additional nitrogen fertilization under commercial growing conditions for maximum yield.

Pea seeds, cultivar Perfected Freezer, were grown as described earlier[6]. Harvested seeds were freeze dried for 24 hrs, ground and sieved through a 60-mesh screen for further analysis. Nitrogen determination was made using the micro-kjeldahl procedure[7]. DNA and RNA were extracted, purified, and determined by UV absorption according to the method described by Holdgate and Goodwin[8]. A Beckman DB-G spectrophotometer equipped with a recorder was used for measurements. Highly polymerized RNA and DNA (Calbiochem) were used as standards and received the same treatments as the plant extracts.

Sub-herbicidal levels of Simazine induced a marked increase in total nitrogen of the seeds (Table I). The maximum increase of 24·9% occurred with the 0·10