

## *Peronospora ciceris* – a new species on *Cicer arietinum*

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A new species of *Peronospora ciceris* collected on *Cicer arietinum* L. is being reported for the first time from India and constitute maiden report for the science.

**Key words :** Downy mildew, *Peronospora ciceris*, India

### INTRODUCTION

Chickpea (*Cicer arietinum* L.) is an important grain legume pulse crop for the vast majority of vegetarian population in the Indian sub-continent, South West Asia, Northern and Eastern Africa as well as in Central and South America. In India the crop is widely grown in Uttar Pradesh, Haryana, Punjab, Rajasthan, Bihar and Madhya Pradesh and has several vernacular and common names associated with it such as gram, spanish pea, chestnut bean (English), pois chiches (French), homos (Arabic), garbanzo (Spanish) and Chana (Hindi). The total area under chickpea cultivation occupied 9.3 million hectares (FAO, 1981) and the production 4.7 million tonnes while in 1999 production has been increased to as 6.01 million tonnes.

The present paper deals with a downy mildew fungus which was collected on chickpea from Kanda Ghat near Solan, Himachal Pradesh (H. P.), India during a collection trip in March, 1999.

The genus *Peronospora* is a widely occurring fungus. So far thirty two species have been recorded on 55 different hosts from India (Saccardo, 1891; Yerkes and Shaw, 1959 and Mc Meekin, 1969) out of these, ten are reported from Himachal Pradesh only (Sharma and Munjal, 1977).

White cottony growth of the fungus was observed in patches on the lower surface of the leaves forming chlorotic spots of small to large size on the upper surface. Under high humid conditions and low temperature, the downy growth was also noticed on the petioles of the plants. Under severe infection

the leaves turned dark grey coloured and mottled.

*Peronospora ciceris* Agarwal, Kulshreshtha, Bhalla et Sarbhoy sp. nov. (Fig. 1 and Fig. 2)

Mycelium byssaceum, hyalinum vel album, coenocyticum, ramosum, intercellulare vel intracellulare, cum ramosis gongylodibus haustoriis. Sporangiphora erecta, 3-6 fasciculata, e stomatibus oriunda, 3-7 dichotome ramosa, pallida, ad apicem, bifurcata, curvata et deflexa, angustata,  $15.5 \times 24.4 \mu\text{m}$  and  $4.50 \times 6.0 \mu\text{m}$ . Stipes tenuis, crassus, leviter inflatus ad ramorum juncturam interdum ad basim,  $125.0-250.0 \times 2.0-7.0 \mu\text{m}$  diameter. Ramosus apices ex sporangiophorae  $155.0-217 \times 12.4-18.8 \mu\text{m}$  (av.  $186.0 \times 15.6 \mu\text{m}$ ), acuti, ferentes singularia sporangia.

Sporangia ellipsoidea vel ovoidea, hyalina vel pallide ochracea,  $13.6-27.2 \times 13.9-18.6 \mu\text{m}$  (av.  $20.4 \times 16.2 \mu\text{m}$ ), tenuitunicata, laevia. Oosporae sphaeroidae, vel ovoideae, apleurotae, luteae ochraceae (Ridgway catellus XV 15), crassotunicatae, parietibus 3-4 stratosi, verrucosis,  $24.8-27.9 \mu\text{m}$  (av.  $36.3 \mu\text{m}$ ) diam.

Holotypus : in follis et petiolis *Ciceris arietini* L. (Leguminosae), Kandaghat, Solan, Himachal Pradesh, India, Coll., M. Kulshreshtha et K. Bhalla, March, 1999, HClO. 43,131.

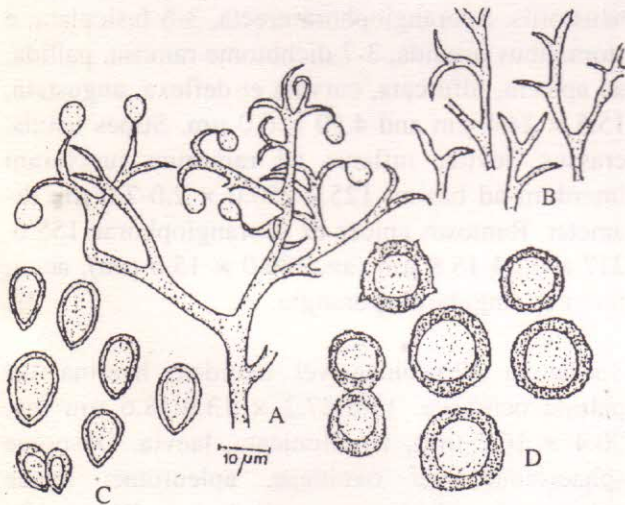
Mycelium cottony, hyaline to white, coenocytic, branched, intercellular or intracellular bearing branched knob-like haustoria. Sporangiphores, erect, arising in a fascicles of 3-6 from the stomata, 3-7 times dichotomously branched, at the upper

**Table 1 :** Comparison of *P. ciceris* with closely related *Peronospora* species.

Fungus	<i>P. media</i>	<i>P. rumicis</i>	<i>P. viciae</i>	<i>P. cynoglossi</i>	<i>P. hedeomatis</i>	<i>P. lapponica</i>	<i>P. meliloti</i>	<i>P. ciceris</i>
Sporangiophore (length/branching)	upto 400µm long, 4-9 times	150-363µm long, 4-6 times	150-350µm 5-10 times	Not cited*, 6-8 times	160-460µm long, not cited*	658-700µm long, not cited*	165.5-76.5µm long, not cited*	155-217µm long, 8-7 times
Sporangia (size/shape)	23-33 × 14-22µm, ellipsoid or ovoid	25-35 × 16.5-20µm, ovoid	19.2 × 16-19µm, ovoid	13.9-19 × 15-24µm, subglobose to ellipsoid	24-30 × 14-17µm, globose, sub-ovoid at maturity	30-36 × 19-24µm, citriform	22.5-33 × 18-22.5µm, spherical to elliptical	27.2-34 × 13.9-20.4µm, ellipsoid to ovoid
Oospore (size/shape/ornamentation)	30-40µm, spheroid to globose not cited*	not cited*	22-26 µm, spheroid, reticulate	25-30 µm, subglobose to ellipsoid, smooth-walled	22-30 µm, globose to ovoid, hyaline smooth	27 µm, globose not cited*	27-28.5 µm, spheroid not cited*	24.8-27.9 µm, spheroid, verrucose to warty
Host	<i>Stellaria media</i> L.	<i>Rumex hastatus</i> D. Don.	<i>Vicia tetrasperma</i> Moench	<i>Cynoglossus officinalis</i> L.	<i>Hedeomatis hispidum</i> Persoon	<i>Lapponia lutensis</i> L.	<i>Melilotus indica</i> L.	<i>Cicer arietinum</i> L.

\* Not observed in the original descriptions. Underlined = Somewhat similar to *P. ciceris*.

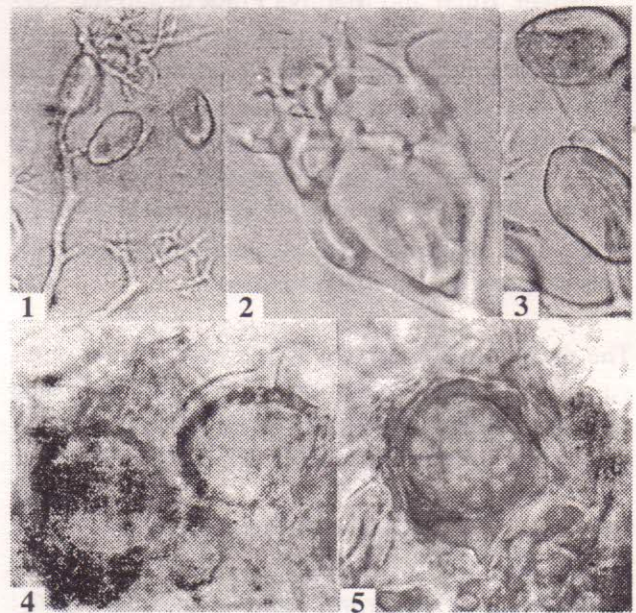
portion light pale in colour, ultimate branches bifurcate, curved and deflected from the axis, tapering than the tips, 15.5-24.4 µm × 4.50-6.0 µm.



**Fig. 1 :** *Peronospora ciceris*. A. Sporangiophore with sporangia; B. Branching pattern of sporangiophore; C. Sporangia; D. Oospores.

Stipe slender, stout, slightly swollen at the junction of the branches, sometimes also at the base, 125.0-250.0 × 2.0-07 µm. Branched tips of the sporangiophores 155.0-217.0 × 12.4 × 18.8 µm in size (av. 186.0 × 15.6 µm), acute, bearing single sporangium at the pointed end. Sporangia ellipsoid to ovoid, hyaline to pale ochraceous, 13.6-27.2 × 13.9-18.6 µm (av. 20.4 × 16.2 µm), thin walled, smooth. Oos-

pores spheroid to ovoid, apleurotic, yellow ocher (Ridgway Plate, XV-15), thick-walled, wall layers 3-4, verrucose to warty, 24.8-27.9 µm (av. 26.3 µm) in diameter.



**Fig. 2 :** *Peronospora ciceris*. 1. Sporangiophore and sporangia; 2. Branching pattern of sporangiophore; 3. Sporangia; 4. Oospores; 5. Three layered walled oospores with warts. Magnification 390x and 600x.

Holotype : On leaves and petioles of *Cicer arietinum* L. (Leguminosae), Kandaghat, Solan, H. P., India, Coll. M. Kulshreshtha and K. Bhalla, March, 1999, HClO. 43, 131 (Type).

A comparison (Table 1) of the various morphological and taxonomical characters with seven other closely related *Peronospora* species clearly showed that *P. ciceris* is a distinct species from the above known species and has no resemblance with them in the size of sporangiophore, sporangia and oospores. The review of literature also reveals that there is no report of downy mildew occurring on the host *Cicer arietinum* L. (Index of Fungi, 1999 ; Sarbhoy *et al.*, 1992), hence the epithet "*ciceris*" is proposed.

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