

Serine-induced formation of aerial hyphae and conidia

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Abstract

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Louie, S., A. Chan and G. Sojka. Serine-induced formation of oeriol hyphae and conidia by a *Neurospora* mutant.

ser-2 (isolate #65004) is a very "leaky" serine auxotroph. It grows rapidly on minimal medium but does not form abundant oeriol hyphae or pigmented conidia unless supplemented with L-serine. It also responds to glycine, but no other amino acid, or intermediate

in the serine biosynthetic pathway, can substitute for serine. The addition of swine to cultures growing on solid media causes the mutant to form aerial hyphae and pigmented conidia at approximately the same rate as do wild type strains on minimal media. This property was examined by comparing growth rates of *ssr-2* and a wild type strain (*STA4*), employing a variety of growth parameters.

Figure 1 shows the results of an experiment designed to compare the rate of hyphal elongation on solid Vogel's minimal medium (2% sucrose as carbon source). This method ignores penetration of hyphae into the agar and oeriol hypha formation (Zolokar 1959 Am. J. Botany 46:555). Under these conditions *STA4* and *ser-2* show identical growth rates in the absence of serine.

When these strains are grown in Vogel's minimal liquid medium with vigorous agitation, dry weight increases logarithmically for at least 24 hours (Luck 1963 J. Cell Biol. 16:483). Formation of oeriol hyphae and conidia is minimized in submerged culture, yet Figure 2 (which is representative of many such experiments) indicates that *ser-2* grows more slowly than does *STA4* under these conditions.

Growth in stationary liquid culture is essentially unrestricted and 3-dimensional (Marshall and Alexander 1960 J. Bacteriol. 80:412) and can best be expressed as the cube root of the increase in dry weight (Emerson 1950 J. Bacteriol. 60:221). After approximately two days of incubation, wild type organisms begin to form oeriol hyphae above the mycelial mat. The appearance of these structures is delayed at least one week in *ser-2*. The defect can be completely overcome by addition of 0.1 ml serine to the growth medium. From Figure 3 it can be seen that *ser-2* and *STA4* on minimal and serine-supplemented media have, for approximately 2 days, while the mycelial mat is being formed across the surface of the liquid. The failure of *ser-2* cultures on minimal medium to form aerial hyphae results

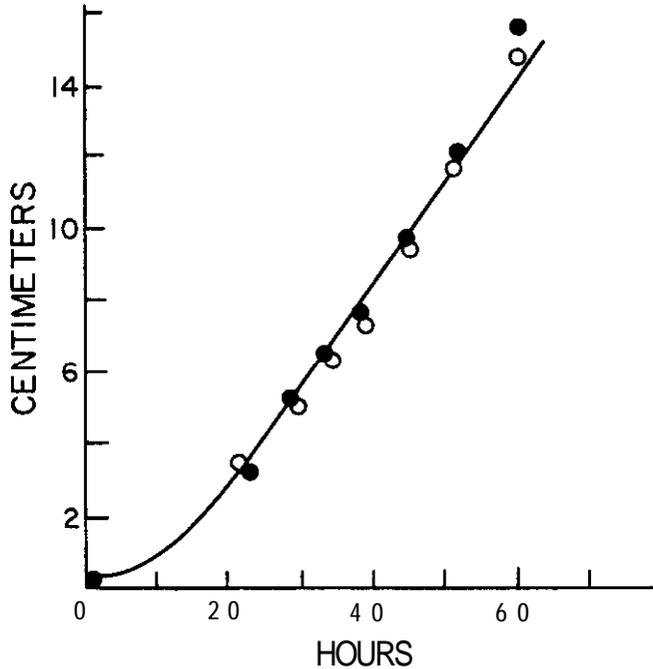


Figure 1. Hyphal elongation in solid medium. Growth tube culture at 30°C in constant darkness on Vogel's minimal medium. (*STA4* open circles; *ser-2* darkened circles).

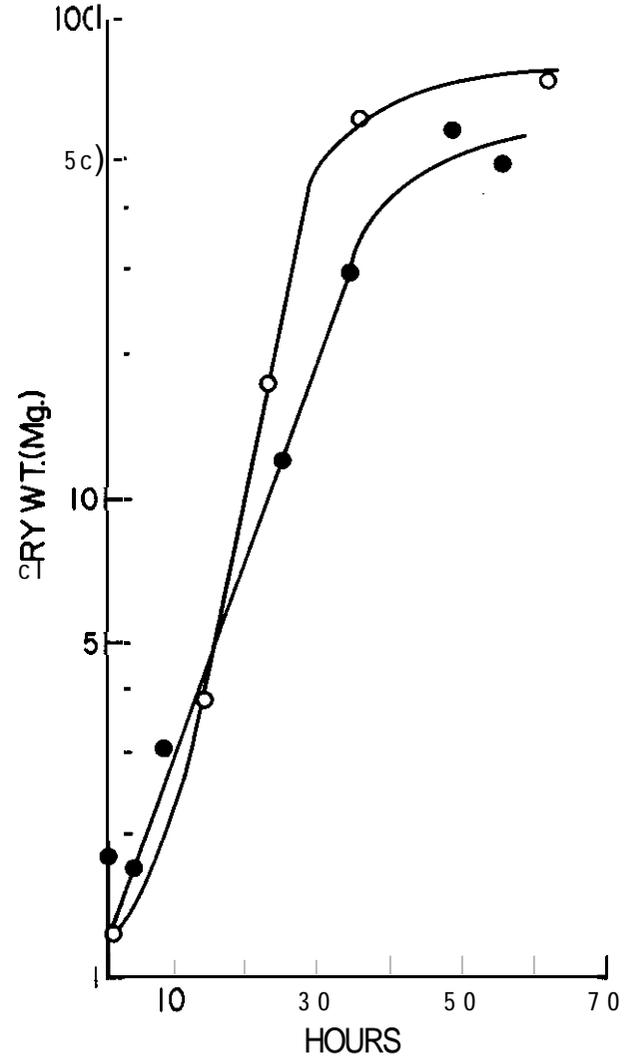


Figure 2. Logarithmic growth in minimal liquid medium. Cultures grown at 30°C in constant darkness. 30 ml. Vogel's minimal medium in 125 ml. Erlenmeyer flasks agitated at 150 rpm.

in a premature cessation of "cube root growth".

We feel that these data suggest that rer-2 is a biochemical-developmental mutant which requires additional serine only for the production of aerial hyphae and pigmented conidia. This mutant is obviously able to synthesize sufficient serine to support normal growth of the basal mycelial mat. The conidia formed on ser-2 (either by supplementation with serine or prolonged incubation) appear to be similar to those of the wild type in size, shape and carotenoid pigment content. ---
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Figure 3. "Cube root growth" in stationary liquid cultures. 125 ml Ehrtenmeyer flasks containing 25 ml of liquid medium were incubated at 30°C. The results of the experiment were not affected qualitatively by a wide range of inoculum sizes of filtered conidia. (STA4 on minimal medium, open circles; ser-2 on minimal medium, darkened circles; ser-2 on 0.1M L-serine-supplemented medium, half-darkened circles).

