THE LOCATION OF THE SECRETIONS THAT ATTRACT MALE
HETERODERA SCHACHTII AND H. ROSTOCHIENSIS
TO THEIR FEMALES

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Females of H. schachtii and H. rostochiensis secrete male attractant all over the body, so it is
probably produced by the hypodermis or distributed in the pseudocoelom rather than by
special glands opening to the surface. More attractant is secreted around the tail of H. schachtii
females than around the head, so the egg sac can act as a carrier of the pheromone whereas the
small egg sac of H. rostochiensis does not. A correlation between the attractiveness of H. schachtii
females and the presence of an egg sac suggests that a single mechanism may control secretions
from several organs.

Most female cyst-nematodes secrete a copious jelly-like egg sac from the vulva. In many species eggs are laid in the jelly which protects them from injury and
desiccation. In a few species eggs are not laid externally, so the secretions are a
vestigial excess of the medium surrounding the eggs within the vagina, or have
some special function. The egg sac is mostly a polysaccharide secreted by the
uterine walls (Mackintosh, 1960), not itself a pheromone, but possibly acting as a
carrier. Secretions from the anus become incorporated (Jones, 1970). Egg sacs
are usually first secreted soon after females rupture the root cortex, and are then
added to intermittently. After each addition they shrink a little as a watery
component spreads into the surrounding medium. The separate gelatinous and
water components are more easily distinguished when the females are immersed
in liquid paraffin. H. rostochiensis Woll. females sometimes secrete a small vestigial
egg sac (Williams, 1957) and, in liquid paraffin, often produce a watery secretion
with a few strands of jelly.Attraction of males seems to occur when females of
H. rostochiensis begin to secrete from the vulva (Doncaster, priv. comm.). We
studied the watery component of the egg sac to see whether it was the source of
attractant.

METHODS

Attractiveness was assessed by the movement of males relative to a source of
test material placed at the centre of 50 mm circular plates of 0.8% water agar.
After allowing 1½ hours to establish gradients, males were placed on a circle 20 mm
in diameter around the source and their distribution noted after 1 hour and 3
hours (so that chemicals diffused for 2½ and 4½ hours). The log. scores of their
distribution (Greet, Green & Poulton, 1968) were calculated. These can have a range from 2.5 to 0.7, a score of 2.5 indicates total attraction and 1.0 random distribution, i.e. neither attraction nor repulsion.

Vulval secretions produced during 18 hours were collected from females on roots. Long sections of root with females attached were cut from plants whose roots had been suspended in aerated water (Green, 1966; Green, Greet & Jones, 1970). The roots and females were cleaned of debris and arranged on 90 mm diam. agar plates. The females, cuticles and vulvae were dried with filter paper triangles and the females so arranged that their vulval secretions were unlikely to touch either roots or agar (Fig. 1a). After 18 hours, vulval secretions from individual females were collected on 1 mm squares of filter paper. These and the females were bioassayed for attractiveness.

The attractiveness of secretions from the heads and tail ends of females was compared by bioassaying drops of water confined on each separately for 18 hours (Fig. 1b). Virgin females were taken from roots, surface dried with filter paper and put between the ends of two 5μl glass capillary tubes filled with distilled water. The female body separated the capillaries with the head in one and the tail in the other. The open ends of the capillaries were sealed with Silicone Fluid (MS 550R) and the capillaries and females were put in a petri dish lined with moist

Fig. 1a: The arrangements of roots and females on agar plates. Left with vulval secretions isolated, right with vulval secretions touching the agar.—b: The position of capillary tubes over the head and tail of a female.

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