Equipment and Techniques for Establishing Field Microplots for the Study of Soilborne Pathogens[1]

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Microplot methodology (2, 3) is becoming increasingly important in investigations of quantitative relations between nematodes and plants (1). Because meaningful information depends on a large number of plots, an apparatus was developed that is driven by a farm tractor power-take-off (Fig. 1-A). This apparatus (M-cutter) removes a 76-to-80-cm-diam ring of soil (ca 5 cm wide and to depths of 50–55 cm), thereby facilitating establishment of permanent fiberglass microplots with minimal disturbance of the soil profile.

Primary construction (top and walls) of the M-cutter body is of steel 9.3 mm thick (Fig. 1-B). The tube for attaching the M-cutter to a tractor-mounted post-hole-digger gear box has walls 12.7 mm thick with a standard opening of 6.67 cm. The M-cutter tube is attached to the gear box with a 12.7-mm-diam high-quality "shear" bolt. Holes (12.7 mm diam) for attachment are 5.0 cm below the top of the attachment tube. Six 25-mm angle-iron brackets support the body of the M-cutter to the attachment tube (Fig. 1-B). The cutting surface is composed of carbon-tip [(5.6 × 10.6 mm) 5 cm deep] teeth with 25°/55° angles. Constructing teeth with an outside angle of 8–10° instead of 25° improves the performance of the M-cutter (R. Rodriguez-Kabana, unpublished). These teeth, with attached carbon-steel tips, are 7.8 cm apart. To facilitate removal of displaced soil, six 9.5-mm × 9.5-mm key-steel rods (louvers) are welded 40 cm apart (45° angle) on the outer surface. The teeth are "set" to give a cutting surface of 4 to 5 cm. Six 11.4-cm-diam holes in the top plate prevent material from accumulating and allowed some loose soil to move up through the top.

During operation, the initial position of the M-cutter must be vertical, so the tractor must be positioned to ensure that the holes are cut at 90°. If soil is moist, displaced soil should be removed at a given position with a shovel.

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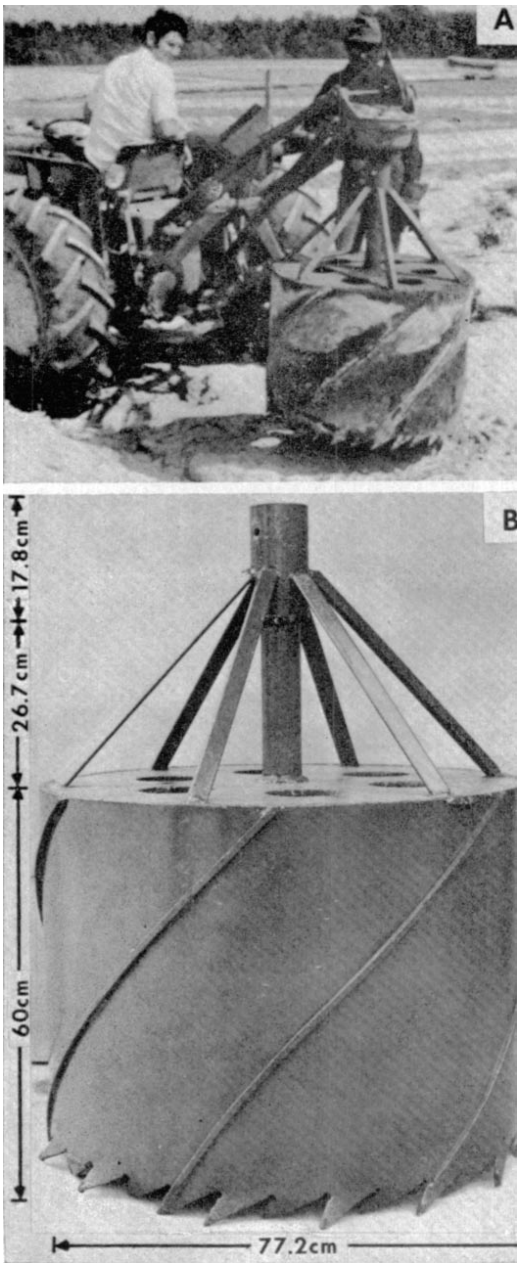

FIG. 1(A-B). Microplots. *A)* Tractor-mounted apparatus for digging ringlike holes for circular fiberglass barriers. *B)* Details of construction of M-cutter.

Fiberglass cylinders (barriers) can be readily installed in the ringlike holes, especially in rock-free sandy soils. Should soil fall into the holes, a 1-m² piece of plywood can be placed on a given cylinder and force applied to position the cylinder to the desired 50-cm depth.

Fiberglass cylinders are assembled from panels [60 cm wide × 2.475 m long (12 cm for overlap) × 0.9 mm thick] of fiberglass [flat, clear, fortified, 4 or 5 oz/ft² (0.16 g/cm²) Lascolite Crystalite, Lasco Industries, Florence, Kentucky]. The surfaces of both ends of each fiberglass panel, to which are attached 10 × 70-cm strips of linear fiberglass tape, are sanded with a belt sander. After cleaning, each panel is positioned to form a 76-to-80-cm-diam cylinder and held together temporarily with small pieces of "duct" tape. The strips of fiberglass tape are dipped in a polyester resin (Aropol; Ashland Chemical Co., Ashland, Kentucky) and activator (Lupersol DDM; 60% methyl ethyl ketone peroxide in dimethyl phthalate; Lucidol Division, Pennwalt Corp., Buffalo, NY) (for use with fiberglass) and attached over each "seam." The 2-to-6-cm excess fiberglass tape is lapped over the top of the cylinder. After drying, the taped seams are painted with the resin plus activator. All work with these chemicals was done in open or well-ventilated areas.

The soil is treated with methyl bromide to kill indigenous nematodes and other soil pests. Before treatment with 151 g methyl bromide/m² (3 lb/100 ft²), three or more 12-cm holes are made per plot to facilitate penetration by the gas. With this high rate, nematodes or plants should not be introduced for 1-2 months after treatment. Appropriate numbers of mycorrhizal fungi (*Glomus* spp., etc.) and other normal beneficial organisms (*Rhizobium* spp. for legumes) should be introduced into each plot at the time nematode populations are established.

Thorough mixing of given species of soilborne pathogens in this type of microplot (Fig. 2) can yield useful quantitative data for most crops. Because of minimal competition (plots spaced 1.5 m apart), an anomalous result sometimes encountered is a 2-to-3-fold greater yield of annual crops than occurs with normally spaced plant populations.

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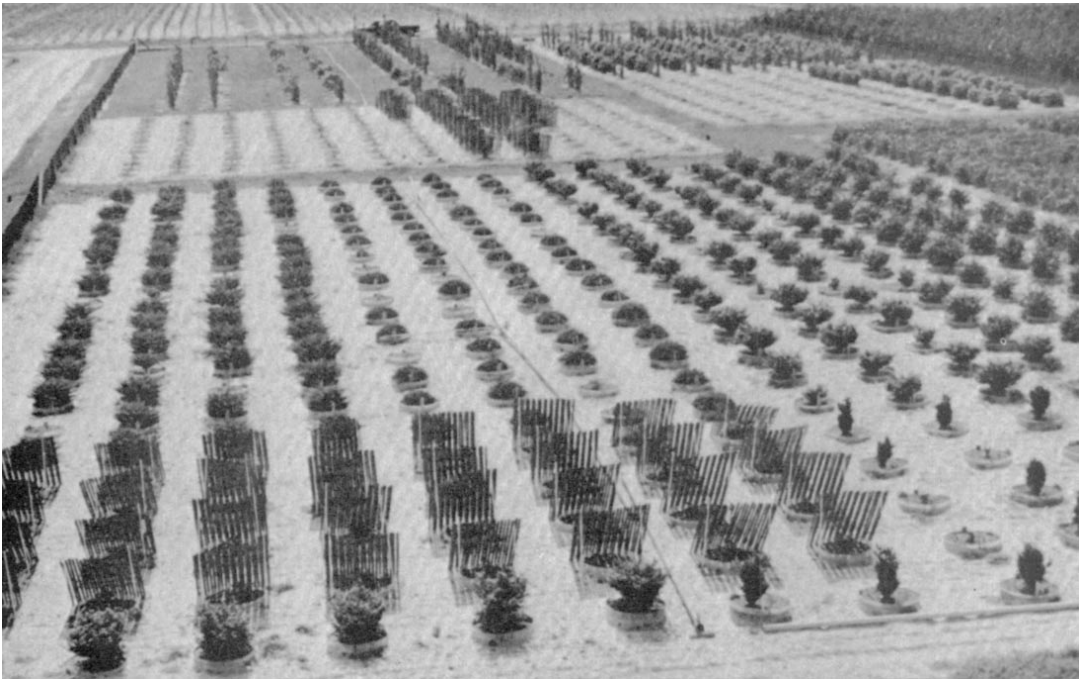

FIG. 2. General view of microplots with various species of plants and nematodes.

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