present, would be 21 times the cost of intermittent chlorine. A continuous HCl treatment would be 10 to 25 times more expensive than an intermittent chlorine treatment.

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Multiple Cropping with Trickle Irrigation[1]

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Abstract. **Pepper (*Capsicum frutescens* L.) and summer squash (*Cucurbita pepo* var. *melopepo* (L.) Alef.) were grown in immediate succession in undisturbed beds using trickle irrigation with various treatments. Highest combined yield in metric tons/ha for both crops was obtained with film mulch + soil fumigation (117.6) followed by film mulch (112.3), soil fumigation (93.4) and control (69.0), respectively. Yield from the second crop was negatively correlated (r=–.87) with the degree of plant infection with root-knot nematode (*Meloidogyne incognita* (Kofoid & White) Chitwood). Intensive production in this manner allows fixed costs to be defrayed over two crops thus increasing the magnitude of return per dollar invested. Multiple cropping of pepper and squash with trickle irrigation has an excellent potential in south Georgia provided nematodes and other soil-borne pathogens can be adequately controlled.**

Use of trickle irrigation for high value row crops has increased dramatically in the southeastern U. S. in the past 2 years[2]. Its use, especially in conjunction with soil fumigation and film mulch, has resulted in remarkable yield increases for vegetable crops such as pepper, tomato, cucumber, squash and pole bean. Because of the high initial costs of film mulch and soil fumigation, considerable interest has been displayed in the possibility of multiple cropping, growing a second crop immediately after the first. While double cropping has been successful with film mulch and overhead irrigation (1,2), the technique has been little explored with trickle irrigation. Trickle irrigation has the additional advantage of allowing the frequent application of low levels of soluble nutrients to the root zone under the film mulch. This study was directed toward determining the potential of multiple cropping with trickle irrigation and ascertaining possible production problems.

Crop 1 Pepper transplants, cv. Hungarian Hot Yellow Wax, were field planted May 15, 1974 in a Tifton loamy sand. Beds, 9.1 x 1.6 m, were planted with transplants 30 cm apart in the row, with 2 rows 40 cm apart on each bed. Irrigation water and a majority of the N and K fertilizer was applied through 2 Bi-Wall[2] trickle lines per bed. The lines were placed 15 cm from the plants, parallel to the rows, and 13 cm from the edge of the beds. Treatments included with and without 2 mil aluminum-coated film plastic over the beds and with and without a broad-spectrum soil fumigant in all possible combinations with 4 replications. DD-MENCS[3] (Vorlex) was applied at 327 liters/ha through 5 chisels 22.5 cm apart, 20 cm below the soil surface. Prior to fumigation all plots received 550 kg/ha 10N–4.3P–8.3K and 146 kg/ha P broadcast and rototilled into the top 15 cm of soil. Additional N and K was applied through the trickle lines at each irrigation at the rate of 2.8 kg N and 3.3 kg K/ha/day for the first 20 days after transplanting and 5.0 kg N and 5.1 kg K/ha/day for the remaining 60 days.

The final pepper harvest was made August 5, 1974 after which the plants were decapitated just above the plastic and removed.

Crop 2 'Dixie Hybrid' summer squash was direct seeded (3 seeds/hole) Aug. 6, 1974 through the same holes in the plastic that the pepper had been planted. On beds without plastic, seeds were placed directly adjacent to the stumps of decapitated pepper plants. Fertilizer was applied through the trickle lines at each irrigation at the rate of 3.6 kg N and 3.5 kg K/ha/day. A root-gall index was taken from plants near the end of each bed, 16 days after seeding and at the end of the season. Individual plants were rated on a 1-5 scale (1 = no galling, 2 = 1-25%, 3 = 25-50%, 4 = 50-75%, 5 = 75-100% roots galled). Soil samples (20 cores, 2.1 x 20 cm) were also collected for nematode assay. Soil samples were mixed thoroughly and a 150 cc aliquot was processed by a centrifugation-flotation method (6) to separate nematodes from the soil.

Film mulch alone produced the highest yield in the initial crop, followed by film mulch with soil fumigation, soil fumigation and control (Table 1). DD-MENCS typically produces some initial stunting of transplants (3, 4); however, in soils with moderate to severe nematode and/or soil-borne plant pathogen pressure, this treatment will often produce a substantially higher final yield than film mulch alone. The results indicate (Fig. 1) that with the initial crop (as reflected by population at the beginning of the second crop), nematode pressure was not severe, which would account in part for the

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[2]Based on information supplied by E. I du Pont de Nemours and Co., manufacturers of Viaflo trickle tube and Reed Irrigation Systems, manufacturers of Anjac Bi-Wall trickle tubing. Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the U.S. Department of Agriculture nor imply its approval to the exclusion of other products that may also be suitable.

[3]20% methylisothiocyanate + 80% chlorinated C_3 hydrocarbons; NOR-AM Chemical Co.

Table 1. Effect of film mulch and soil fumigation on multiple cropping yields of bell pepper and squash.

Treatment	Yield (metric tons/ha) Peppers	Squash	Total of both crops
film mulch + soil fumigant	53.7 ab[z]	63.9 a	117.6 a
film mulch	61.7 a	50.6 ab	112.3 ab
soil fumigant	49.5 bc	43.9 b	93.4 b
control	43.0 c	26.0 c	69.0 c

[z]Mean separation in columns by Duncan's multiple range test, 5% level.

superiority of the film mulch treatment.

Soil samples indicated that the nematode populations were comprised almost exclusively of the root-knot nematode with only occasional instances of *Criconemoides ornatus* Raski, *Helicotylenchus dihystera* (Cobb) Sher, and *Trichodorus christiei* Allen. The root-gall indices recorded early in the second crop reflected the general buildup of the nematode populations during the pepper crop, a species which under normal conditions is not severely parasitized by *M. incognita*. Yield of summer squash, a preferred host for root-knot nematodes, was significantly reduced by invasion of this parasite (Fig. 1). Final yield, as a consequence, was negatively correlated (r = −.87) with the root-gall index taken early in the growth of the squash crop. Film mulch with soil fumigation most successfully minimized reinfestation. Film mulch alone, if the initial nematode populations are low, has been shown in other studies (5) to inhance plant growth and increase yield, subsequently masking the effects of nematode damage. This would in part account for the relatively high yield response to mulch in the second crop. The degree of correlation (Fig. 1) between root-gall indices recorded at the end of the production period and final yield was lower (r = −.77) and had shifted toward a higher nematode population level in comparison to the regression equation between the root-gall index taken at the beginning of the squash crop and final yield. This indicates that although the nematode populations were lower in the better treatments, the populations in all treatments increased toward the end of the second crop. Therefore, nematode populations could pose a limiting factor in the potential for production of three crops in succession.

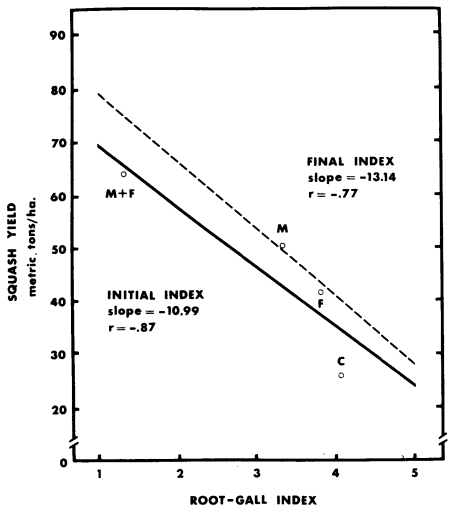

Fig. 1. Linear regression between root-gall indices recorded 16 days after seeding and at the termination of the squash crop and final squash yield. Points represent means of the initial index for film mulch + soil fumigation (M + F), film mulch (M), soil fumigation (F), and control (C).

The ability to spread fixed costs over 2 or more crops in succession greatly enhances the feasibility of the low unit cost – high level of production concept for many vegetables. While the potential to continually apply low levels of fertilizer through the trickle lines is a vital component in the feasibility of multiple cropping, the need for the integration of this potential into a complete production system is apparent. Total combined yield of both crops was highest with film mulch plus soil fumigation, followed by film mulch, soil fumigation and control (Table 1). These results indicate that multiple cropping with trickle irrigation under south Georgia conditions has the potential to increase the profit derived per hectare provided nematode populations can be maintained at a low level. Additional research is needed to moniter the buildup of nematodes and soil-borne plant pathogens in various crop sequences and establish possible control measures.

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Strip Cultivation of the Area Wetted by Drip Irrigation in the Arava Desert[1]

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Additional index words. corn, *Zea mays*

Abstract. **Corn (*Zea mays* L.) grown in the Arava desert of Israel developed more rapidly and produced a higher yield when planted in soil strips which had previously been used for drip-irrigated melons, than when grown in the spaces between strips. Leaching with sprinklers before planting had no effect on the corn grown on the previously drip-irrigated strips, but did significantly effect plant weight and weight of Grade A ears in the area between the previously cultivated strips. Plantings which diagonally intersected the drip-irrigated strips and the spaces between resulted in uneven growth, with better development where the strips were intercepted.**

Within cultivated areas of the Arava desert in Israel there is considerable variation of crop growth and yield (3). Non-uniform soil structure and varying concn of minerals at different depths, even over short distances are responsible (4). These variations are not stable and may be partly due to soil movement by cultivation, or to other cultural practices (3).

The main crops are drip-irrigated, consequently water and fertilizer applications are limited to the irrigated strip through most of the growing season. In a number of studies calculations were made to characterize the nature of water distribution from low-discharge point or line sources (1, 2, 5, 6). Between treated strips, the soil surface remains dry and salts accumulate at the wetting front. Compaction due to workers and implement movement also occurs in this space.

The purpose of the present work was to clarify these points: a) The possible relation between non-uniform growth of crops and the fact that the previous crop had been drip-irrigated in strips; b) The significance of drip-irrigated strips or spaces between them for the following crop; c) The salt distribution pattern after a drip irrigation season, and the possibility for continued crop cultivation without the need of leaching with sprinkle irrigation.

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