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PLANT PHYSIOLOGY

Factors Affecting the Efficiency of Overhead Irrigation - Pot Spacing

Dr. R.C. Beeson, Ornamental Horticulturist

Irrigation efficiency can be defined as the percentage of water applied by an irrigation system that actually reaches the container substrate and is absorbed. For landscape and other potted ornamentals, the average efficiency of overhead irrigation in a typical nursery is probably between 10 and 30%. Several factors can contribute to this general inefficiency with the most significant being container spacing.

Round containers, set in a square or side-by-side spacing in a bed, have 21% open space between the containers making maximum efficiency 79%. With a triangular or offset spacing, such that the space between pots is minimal, the maximum efficiency is increased to 91% (Fig. 1). However, any irrigated space not occupied by containers, such as walkways or driveways, lowers the maximum efficiency. In a 10-container wide bank of 1-gallon pots with an offset spacing and a 12-inch walkway, the maximum efficiency decreases from 91% to 75%. If this same group of containers were then spaced 6-inches apart and the banks reduced to six plants wide, then the maximum efficiency would be further decreased to 20%. With side-by-side spacing, the maximum efficiency is decreased to 17%. With wider spacings, maximum efficiency declines still further.

In these examples, maximum efficiency is based solely upon the irrigated area occupied by an empty pot.

**************insert pictures of pot layout here!!!

However, irrigation efficiency is further decreased by other factors including plant canopy, irrigation uniformity, sprinkler type, operating pressure, wind, and application rate. The effects of these additional factors will be examined in future newsletters.

ENTOMOLOGY

Insecticide Resistance - A natural and dynamic phenomenon

Dr. G.L. Leibee, Entomologist

The development of insecticide resistance is a process in which the susceptible form of an insect is replaced with a resistant form due to exposure to insecticides. How do these resistant forms come about? Mechanisms have evolved in insects that allow them to deal with various toxins found in their food plants. Therefore, they may be "pre adapted" to develop resistance to newly encountered toxins, such as insecticides. Since these pre adaptive mechanisms can vary among individuals in a population, as with any trait, there are often a few individuals that are especially well adapted to tolerate insecticides. These "resistant" individuals, because they are able to survive and reproduce in the presence of insecticides, become the predominant form in the population. The rate at which this occurs can be influenced by many factors: biology of the insect (e.g. length of the life cycle, reproductive capacity, and migratory habits), intensity of insecticide usage, type of insecticide, genetics of the resistance trait, mechanism of resistance, isolation of the population, size of production area, temperature, effects of insecticides on beneficials (parasites and predators), and method of crop culture.

Just as resistance develops as a result of exposure to insecticides, the level of resistance often declines when the insecticide usage is stopped, a process called reversion. This usually occurs because, in the absence of insecticides, the insecticide-resistant forms are at some type of disadvantage relative to the non-resistant forms and can't compete as successfully. These insecticide-resistant individuals are said to be less fit. This lower level of fitness can often be measured as lower egg production, longer life cycle which allows more opportunity for parasitism and predation, or lower mating efficiency.

The rate at which reversion occurs can be influenced by the same factors that influence the rate of resistance development. Reversion is common because most resistant populations still possess susceptible forms or susceptible forms can migrate into the resistant population. Sometimes reversion doesn't occur or is extremely slow because the population covers a very large area, such as the state of Florida, and is composed of only resistant individuals, or there is little opportunity for immigration of susceptible individuals. However, even if reversion does occur and susceptibility is restored, resistance can reappear quickly with resumption of insecticide usage.

Insecticide resistance is easier to prevent than it is to manage after the fact. Since insecticide resistance is a symptom of overreliance on insecticides, the logical thing to do is to reduce the use of insecticides to the very minimum. This can be accomplished by engaging all aspects of integrated pest management, which may include judicious use of insecticides, in the production of the crop.

PLANT BREEDING

Flowering Spathiphyllum II: Increasing Natural Flowering Through Selection

Dr. R.J. Henny, Geneticist

The natural flowering season for most cultivars of mature *Spathiphyllum* is January through July. At other times, plants may be "forced" into bloom by application of gibberellic acid (GA3). This ability to force blooming by treatment with GA3 has reduced the incentive to spend the time and money required to conduct detailed research into flowering cycles. However, even though such research requires large amounts of growing space for long periods of time, it is essential if we hope to increase the natural flower-producing capacity of *Spathiphyllum* cultivars.

In an attempt to increase natural flower production through breeding, we grew a population of hybrids, and harvested flowers weekly over a period of one year. No attention was given to any other characteristic only flower count. The seedlings with the highest total flower counts were crossed and the next population was screened the same way. Again, the plants with the most flowers were selected and hybridized. All other plants were discarded. Then the original parent plants plus the plant selected for high flower counts from the two succeeding generations were divided into uniform single shoots. A replicated test was initiated to determine the flower production of eight different selections: three commercial cultivars and five CFREC-Apopka hybrids.

Once established, five plants of each cultivar were grown for one year in six- inch pots on raised benches in a shaded greenhouse under natural photoperiod. All newly opened flowers were tagged weekly from July 1, 1993, through June 30, 1994.

The mean number of flowers per plant for the year was:
6.1 - for 3 commercial cultivars
12.1 - for 3 first-generation hybrids
22.1 - for 2 second-generation hybrids
These results indicate that it is possible to increase natural flower production of *Spathiphyllum* through breeding and selection. We are currently growing hybrids from the two second-generation plants listed above. Although the ultimate goal is to develop *Spathiphyllum* hybrids which flower continuously, we will be particularly interested in those hybrids that flower well during the fall months.

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