

# **UNIVERSITY OF KENTUCKY**

## **DEPT OF PLANT PATHOLOGY**

### **GROWING CORN IN THE GH**

#### **1-RESEARCH OBJECTIVE:**

To produce a healthy, disease and insect free, corn plant. NOTE added by L. Vaillancourt: anthracnose is a disease that is greatly affected by the host physiological state. To do any kind of anthracnose research it is CRITICAL to have plants that are as healthy as they can be. Sickly, stressed plants will give atypical results. Light is especially crucial. We always use the related non-pathogen of corn, *Colletotrichum sublineolum*, as a quality control in our experiments with *C. graminicola*. *C. sublineolum* will cause disease and substantial rot on sickly or light and water stressed corn plants.

#### **2-GREENHOUSE PARAMETERS:**

The GH parameters are as follows:

29°C Day temp

25°C night temp

16-hour day length

Supplemental lighting consists of 35 x 430 W high pressure sodium fixtures, which are computer controlled to come on at 615  $\mu\text{moles/m}^2/\text{sec}$  and go off at 715  $\mu\text{moles/m}^2/\text{sec}$ , equal to 14,000 Watts, in a room approximately 26' x 34'. Some additional light is available from the adjoining GH sections, which could in some situations affect the day length but does not seem to have a negative effect.

#### **3-SOIL MIX:**

After many trials and regardless of the corn variety, I have found the best mix to be:

3 parts Pro-Mix BX / 2 parts sterilized top soil

## **4-PLANTING:**

a) Using a 10" Azalea pot, put three seeds about 1" deep equal distance apart. Water thoroughly with warm water. Pots can be kept side-to-side until plants become crowded. In the winter they should be about 12 pots per bench (3' x 15'). During the summer, it is possible to have 16-18 plants on one bench but only if your light quality is sufficient. Be sure the soil has warmed up before planting to ensure good germination. Get a quicker start with sweet corn by boosting the moisture content of the seeds just before they are planted. Soak seeds in distilled water at 77 degrees F for 16 hours, and then dry at room temperature for 8 hours before planting. This results in earlier and better uniformity of emergence. Continue watering the pots daily until germination occurs.

b) **Conetainers** : Planting in conetainers begins with filling the cone approximately 2/3 full with the above planting mix . Place a single seed in the center , then fill to 3/4 full . You must leave some space at the top of the conetainer to allow for watering . Keep cones watered daily until germination . After germination , use caution not to get water in the whirl of the seedling . Water the container rack from the side , not the top . Use fertilizers everyday or every other day until plant is inoculated , then use water only .

## **5-CARE/ MAINTENANCE:**

a) **Watering-** Always water early in the day with tepid / warm water. This will help prevent cold soils, which are part of the cause of growth problems such as stunting, striping of the leaves and a general lack of vigor. Do not water the corn from overhead. Avoid at all costs getting water in the whorl where the new growth is originating. Do not overwater the pots, especially when the plants are young - allow them to dry in between waterings - but not to the point of wilting. Be careful, severe drying will also cause growth and development problems later.

b) **Thinning-** After plants have germinated, and depending upon time of year (obviously the plants will grow faster during the

summer), thin each pot down to the two best plants. This usually occurs at about 3-4 weeks.

**c) Fertilization** - After many trials, using many corn varieties and many commercially available fertilizers, including several of the Peters brand and all of the Miracle-Gro brand types, the Miracle-Gro for Tomatoes (18-18-21) worked the best. Plants also responded well to Peters 20-10-20 Peat -Lite formulation. In the spring through fall plants are fertilized at label rates (one tablespoon per gallon) every-other-time they are watered. During the winter, fertilize at every watering because of less frequent waterings. As the plants mature to daily waterings, cut back the fertilizer to every 3-4 days until the plant begins to tassel. At this stage do not fertilize again. Supplemental micro -elements is not needed (do not be fooled by chlorotic striping on the leaves into adding zinc or iron, which usually results in deformed and / or stunted plants). Any microelement formulation we tried, from Peters S.T.E.M. To Hummerts Dynagreen, all resulted in deformities. The addition of a high phosphate bat guano as an organic soil supplement showed an increase in the health and overall growth and development, and showed no ill effects but was cost prohibitive. Also, the culture of corn grown in the field has nothing to do whatsoever with the culture of corn grown in the GH. Never use ammonium nitrate as a supplement (either a soil additive in the soil mix, as a top dressing, or as a drench) - it will in all cases cause burning and scorching of the leaves and severe stunting. Salt build-up in the pot is lessened by using plain water on the weekends (never fertilize on the weekends), which should flush most salts away. The addition of Osmocote to the soil mix or as a top dressing resulted in stunted and deformed plants.

**d) Pests / Pest Control** - Three major insect pests will attack corn in the GH:

**1) Aphids** - found mostly under the sheath at base of the plant

but will also colonize on the underneath side of the other leaves. Not generally a major pest.

**2) Thrips** - found mostly in the tassels and other flowering parts. Can also be found randomly on the topside edges of the leaves. A real issue if you plan to take the plants to tassel. You must have a chemical rotation plan in place. Never underestimate thrips, as they are not picky about hosts and will infest other greenhouse plants, making you the bane of your fellow researchers. The granular systemic Marathon offers good protection when used in a pesticide rotation.

**3) Spider Mites** - Overall, the most serious pest, they are usually found on the underneath side of the leaves and sometimes in the bud, in more serious infestations. In serious cases will cause the leave to curl from the sides inward. Spider mites love hot, dry conditions. Left unchecked, they will completely devastate the plant and quickly jump to new plants. Never underestimate the damage these three pests can cause. They will show up and have to be dealt with. Always change pesticides to prevent the mites from becoming resistant.

**4) General Pest Info** - In all cases of pest infestation, the only control we have, besides getting rid of unnecessary plant material and practicing good greenhouse management techniques, is to use aerosols / fumigants. Several aerosols are effective, including Orthene (EPA # 499-421), Attain (499-472), Resmethrin (499-387) and Preclude (499-437), which is a highly effective growth regulator, especially when used in conjunction with the other aerosols mentioned. Two Restricted Use Pesticides, Sulfatepp (8241-10) and Nicotine (8241-09) are highly effective. For further clarification on these pesticides and pesticide practices, see the document Greenhouse Standard Operational Procedure, the section on greenhouse pesticide rules.

Under no circumstances should sprays be used. All the sprays we tested, from Orthene to Pyrethrum to Insecticidal Soap, caused serious leaf damage and / or death. If the spray is allowed to run down the leaf into the bud the result will be serious stunting and

vastly deformed leaves. Therefore, using sprays is not an option.

Yellow sticky trap cards are great at monitoring the pest population. They are good for catching fungus gnats, thrips, white flies, and spider mites. Other research has shown the blue sticky trap card to be more effective at catching thrips but I have not found that to be the case.

**Amendment 7 /01/ 01: The EPA has removed Sulfatepp from the market**

### **NOTES / OBSERVATIONS:**

1) The main limiting factor about growing corn in the greenhouse is inadequate light, cold soils, and high humidity. It should be noted that you will not be able to produce " silk plants " , as there will always be some leave margin chlorosis and loss of lower leaves, just by the very nature of the plant.

2) It should be noted the ph of the pot would decrease as the plants age, which could result in some nutrient deficiencies. Lime, however, is not the answer. Limed soils have shown over time no differences in plant growth (especially over 8-10 weeks).

3) **Buggy Whip** - a condition where the plant does not unfold or unwrap, resulting in major deformities and ultimately death. The cause is still under debate I believe over-the -top watering of young plants to be a major cause, in conjunction with cold soils and especially lower light levels. It becomes very apparent by 10-14 days after germination but can also occur to older plants in periods of very high humidity or low light levels. These plants will not reach any useful size and may as well be thinned from the pot. Watering from the top, or overhead, should be avoided entirely in order to prevent a drop of water from collecting in the whirl, which seems to enhance the condition. Each morning in the greenhouse the gutation that forms on the leaf tips should be gently "flicked " off to prevent the water droplet from running down into the whirl. Also, it helps keeping the plants spread out, which lowers the relative humidity. The condition does seem to lessen during the summer (higher light levels) but the cause is not consistent.

The condition is also very variety dependant. M0-940 and Mp 305 are very susceptible, while Jubilee is not.

**4) Pollination** – Take steps to prevent the escape of the pollen especially in transgenic plants . Either physically remove the anthers or cover it completely with a brown paper bag.

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