



Colorado State Flower Growers Association

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Condensation of Moisture in the Greenhouse by W. D. Holley and W. D. Thomas, Jr.

The condensation of moisture on plants can be the cause of many troubles in the greenhouse. Most of the disease organisms which attack the surface of plant leaves, stems or flowers must have moisture in which to germinate and invade the plant tissues. This is especially true with Septoria, Alternaria and bacterial leaf spots of carnations, rust on carnations or snaps. Botrytis blight of snaps, Botrytis petal blight on chrysanthemums, African violets, cyclamen, carnations, and many other greenhouse crops.

The spore fruits of the rose mildew fungus will not release their spores in water but, instead, require an atmosphere fluctuating from near to slightly below saturation. Condensation for short periods favors germination and invasion by the spores themselves. High atmospheric moisture favors optimum growth of the fungus. This means that just before water forms on the leaves or just as it is drying off, conditions are optimum for most rapid growth and spread of mildew on roses.

How condensation occurs

Although the mountain and plains area is considered a dry one, the humidity is often just as high as in any area, especially at night. The amount of water held by air at any given time is dependent on its temperature. A warm air will hold more water than a cool air. As air cools, its relative humidity becomes higher. A relatively dry, warm air can cool 20 degrees and become saturated or nearly so. Constant mixture of air, as is accomplished by wind, will keep the humidity lower than if that same air is still.

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An atmosphere that is near saturation with humidity, when passed over a slightly cooler object, will deposit moisture in the form of condensation. Cold drafts hitting warm plants in an atmosphere of high humidity will also cause condensation to form on the plants in a very short time.

Another factor involved is plant temperature. During the day, when the sun is shining, plant parts in the sun become much warmer than the air temperature read from the house thermometer. As soon as the sun is low in the afternoon, or when the sky becomes cloudy, these plant parts begin radiating heat. Before the heating system is in operation leaf temperatures can be several degrees cooler than that registered by the house thermometer. With a dropping temperature plants lead the downward trend, usually by several degrees. The cooler leaves or stems can condense moisture out of the air before it becomes saturated. Once the leaves are moist several hours of steady heat may be required to dry them off.

Therefore, it is well to keep in mind that conditions recorded by greenhouse thermometers or hygrometers are indicative only of the average atmospheric conditions about the benches, not among the plants in the benches. There are numerous examples to illustrate this point. It is highly possible for the air at 85°F. to have a relative humidity of 35 percent; yet, the air less than an inch from the lower leaves of plants will be 78° with 100 percent relative humidity. Such conditions occur repeatedly toward evening or on partly cloudy days, and the movement of air through the ventilators can be the one principal controlling factor.

How to Avoid Condensation

1. Water as early in the day as possible to allow the maximum ventilation period before the ventilators are closed.
2. Close ventilators gradually to avoid a sudden and rapid climb in the relative humidity.
3. Have at least one heating coil on in each house before closing ventilators tight in the afternoon or evening.
4. If the outside air temperature is near the temperature desired inside, it is necessary to run steam with the ventilators partly open. This is not necessary after nights are cold enough to require steady heat.
5. Avoid fast drops in temperature which are a common occurrence in the mountain area from November through March or April. To help avoid these drops it may be necessary to study the daily pattern of temperatures to learn when the rapid drop begins. Once this is determined one or more heating coils can be turned on in each house at the time the ventilators are lowered the first time in the afternoon. This additional heat will cushion the fast drop in temperature, spreading it out over a longer period, and will help to avoid condensation.