GREENHOUSE winter readiness

Key considerations for maintaining crop performance during winter

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BELOW
Winter is coming and with it, the challenge to manage a consistent climate in the greenhouse.

WINTER TEMPERATURE CHALLENGES

Temperature affects how plants grow and function. Prolonged cold can slow growth, restrict water and nutrient uptake and, in severe cases, cause plant death. Cold conditions can also contribute to circumstances that favour some diseases. Understanding these effects is an important part of greenhouse management during winter.

Each crop has a favorable temperature range, but the optimum depends on the plant process being considered. Lower and upper threshold limits also vary with the variety, growth stage and length of exposure. A limit associated with slower development is not necessarily an injury or survival limit. This distinction matters when interpreting a temperature drop caused by a heater breakdown or power failure.

Maintaining consistent conditions throughout a greenhouse can be challenging. Sensors in the centre may not reflect colder areas near doors and wet walls. Plants in those areas can experience different leaf and root-zone temperatures, even when the central reading appears normal. Reducing unwanted draughts through wet-wall openings and door seals can help limit heat loss and heating demand.

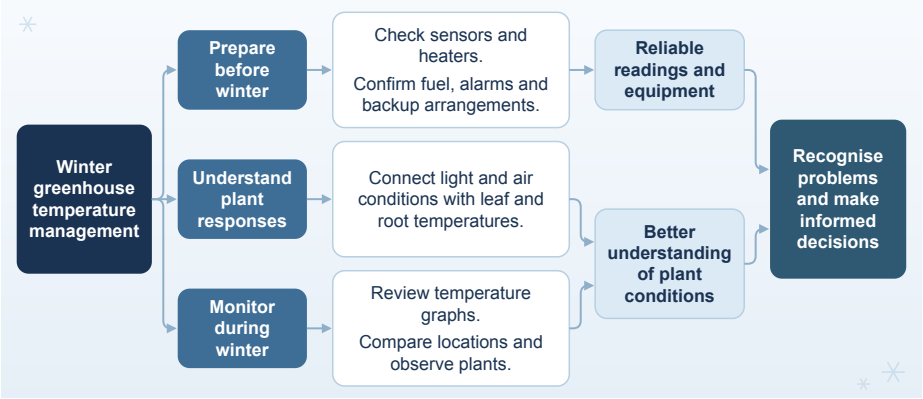
However, retaining heat is only part of the picture. Light, humidity, air movement and irrigation-water temperature also affect what plants experience. This article connects those relationships with preparation before winter and monitoring



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RIGHT

Winter greenhouse management combines preparation, an understanding of plant responses and ongoing monitoring.



during the season, focusing on how to interpret conditions rather than relying on one temperature reading.

HOW PLANTS RESPOND TO WINTER GREENHOUSE CONDITIONS

Winter brings shorter days, changing sunlight and colder outdoor conditions. These changes affect the energy plants receive and the water they lose. As a result, plants can experience different conditions even when the greenhouse temperature setting remains unchanged.

Light and temperature work together. During cloudy weather, less natural light is available for photosynthesis, and heating cannot replace that missing light. In Canadian cannabis greenhouses, supplemental lighting supports lighting schedules, commonly including a 12-hour light period during flowering and 16 to 18 hours during vegetative growth. These schedules describe duration, not the total amount of light reaching the plants. Full-spectrum lighting is also used in winter production, but spectrum alone does not determine yield or potency.

Cooling affects humidity and leaf moisture. After sunset, greenhouse air and plant surfaces can cool. Relative humidity rises as air cools if its moisture content remains unchanged. Condensation can form when leaves reach the dew point, meaning colder plant surfaces may become wet even while the air near the sensor remains warm. Dehumidifiers remove excess moisture and help reduce conditions that favour condensation. Humidity control contributes to disease prevention, including reducing conditions favourable to bud rot in cannabis, but cannot prevent disease on its own.

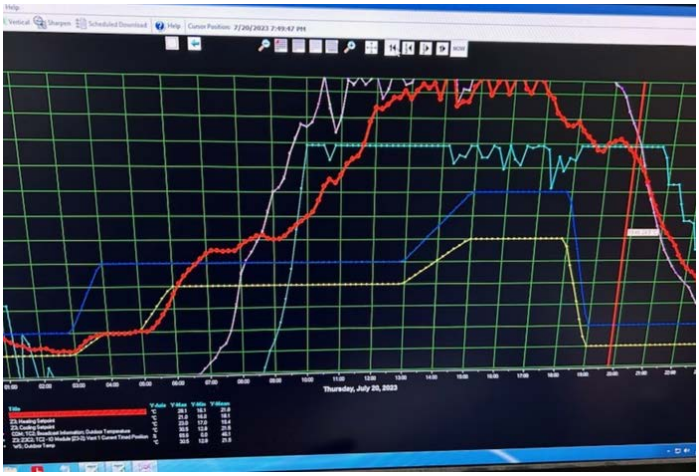
Air movement influences heat and moisture exchange. A thin layer of air surrounds each leaf and affects the movement of heat and water vapour between the leaf and its surroundings. Air movement changes that exchange, but its effects depend on leaf temperature, air temperature and humidity. Moving air therefore does not always cool leaves. Circulation redistributes heat and moisture within the greenhouse; it does not remove moisture by itself. This distinction helps



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The above picture shows the effect of cooler night temperature around 12 to 14°C, causing phosphorus deficiency in tomato seedlings. The plants do stay compact but first flower cluster fruits will show cat facing and also growth abnormalities.



Climate control computers provide very precise information on temperature, both day and night, and 24-hour averages, light, carbon dioxide, vapour pressure deficit and relative humidity.

explain why air movement and moisture removal serve different purposes.

Roots can experience different conditions from shoots. Warm air does not mean equally warm growing media. The root zone may remain cold after the air has warmed. Irrigation water exchanges heat with the growing medium, with the effect depending partly on the amount applied and the initial temperatures of the water and growing medium. A water-temperature reading alone cannot describe the resulting root temperature. Low root temperatures can restrict water transport and nutrient uptake. This supports a general physiological explanation, but it should not be presented as a measured response in flowering cannabis.

Together, these relationships explain why temperature should be considered alongside light and water movement through the plant. They also provide context for interpreting observations without assuming that every symptom has the same environmental cause.

TEMPERATURE TRANSITIONS

Temperature management is not only about maintaining daytime and nighttime set points. The rate and pattern of change between day and night can also influence the crop environment. A rapid evening temperature decline can increase relative humidity and bring colder plant surfaces closer to the dew point, while morning warming can create differences between air temperature and plant or root-zone temperature. For this reason, reviewing temperature trends alongside relative humidity and plant observations provides more useful information than relying solely on average temperature values.

MANAGING THE ROOT ZONE DURING WINTER

Winter management extends below the canopy. While greenhouse air temperature can respond relatively quickly to heating, the growing medium and root zone often change more slowly. This difference can influence irrigation response and root activity, particularly during periods of low light or reduced plant transpiration.

Monitoring substrate moisture, irrigation volume, drainage and root-zone conditions together can help growers understand whether plants are using the water being supplied. During periods of reduced transpiration, maintaining the same irrigation strategy used under higher-light conditions may result in excessive moisture in the growing medium. Conversely, excessively dry conditions can restrict root activity and make subsequent irrigation more difficult to manage.

The objective is therefore not simply to maintain a particular moisture level, but to understand how the root zone is responding to changing environmental demand. Recording irrigation events alongside greenhouse temperature, humidity, light levels and substrate measurements can help identify patterns and support more precise irrigation decisions throughout the winter.

WINTER PREP

Winter preparation should begin before the first cold spell. Checking sensors, servicing heaters and planning fuel deliveries early leaves time to address faults before heating becomes essential. Preparation also makes responsibilities clear, so important tasks are not missed during busy periods.

Check sensor accuracy. A believable reading can still be inaccurate. Before winter, compare sensors with a calibrated reference instrument under the same conditions, following the manufacturer's instructions. If the difference exceeds the specified tolerance, arrange calibration, adjustment or replacement as appropriate. Comparing sensors in different greenhouse locations does not confirm accuracy because those areas may genuinely have different temperatures. Keep a simple record of the checks so that later discrepancies can be investigated.

Service heaters early. Arrange for a qualified technician to inspect heating equipment, including controls, safety devices and exhaust arrangements, according to the manufacturer's requirements. Early servicing allows time to order parts and complete repairs. Waiting until a heater fails on a cold night turns a maintenance problem into an urgent interruption.

Keep track of propane. Include tank-level checks in the winter routine and record consumption and deliveries. Confirm refill arrangements and delivery lead times with the supplier before winter. Prolonged cold increases demand, while snow or difficult

access may delay deliveries. Assign responsibility for checking supplies and contacting the supplier, with another person available to cover absences.

Confirm backup responsibilities. Have qualified personnel check that backup arrangements will function during a power failure. Confirm that alarms reach the responsible person and that contact details are current. Equipment readiness and a clear response plan belong together: an alarm cannot resolve a problem if nobody receives it or knows who should act.

INTERPRETING OBSERVATIONS

Preparation establishes a reliable starting point, but monitoring shows what happens as winter conditions change. Multiple sensors can reveal differences across the greenhouse that a central reading misses. Those differences become more useful when related to the location and timing of plant observations.

Temperature graphs provide information that daily averages can hide. Readings recorded at 10-minute intervals can show when a drop occurred and approximately how long it lasted, although shorter fluctuations may be missed. These records are very useful after equipment faults or sudden weather changes. An average alone cannot distinguish a steady cool period from a brief, sharper drop.

Sensor placement also affects interpretation. Direct sunlight or nearby heaters can produce readings that do not represent air conditions around the crop. Sensors should be protected from these direct influences. If two readings disagree, consider both instrument accuracy and genuine differences between locations before deciding which explanation fits.

Plant appearance adds context but does not identify the cause by itself. Slow growth, yellow leaves and wilting may result from root problems, unsuitable moisture levels or disease as well as temperature stress. Adding water or fertilizer without understanding the cause may make matters worse.

Connecting observations with environmental records helps distinguish a brief change from a recurring pattern. It also encourages a clear separation between what was measured, what was observed and what remains an explanation to investigate. That distinction makes both day-to-day decisions and later reviews more dependable.

CONCLUSION

Winter greenhouse temperature management combines an understanding of plant responses with dependable equipment and careful observation. A thermostat reading is useful, but it cannot describe every leaf, root zone or cold area within the structure. Light, humidity, air movement and irrigation water all contribute to the conditions around the crop.

Preparation before winter reduces avoidable interruptions, while monitoring helps explain changes during the season. Success should be judged through plant health, consistency and production timing alongside heating costs. A lower fuel bill alone does not demonstrate an improvement if it accompanies slower development or greater losses. The goal is to understand the whole greenhouse environment and recognise problems before assumptions turn into costly decisions.

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