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# Avian Advice

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## Winter Management Tips for Poultry Houses

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The art of efficient winter management relies primarily on three factors-temperature, air quality and humidity/moisture (Fig 1). These three factors are inter-related to each other. If any one of these factors are affected it will sequentially affect the remaining factors. The successful winter management of poultry houses depend on maintaining an optimum balance between these factors.



Fig 1: Winter Management- Primary Factors

### Temperature

Temperature management plays a vital role in poultry farms from first day until the final day of marketing. Chicks are poikilothermic for the first 4-5 days, so they depend on the external environment to keep themselves warm. The brooding temperature helps the chicks to stay warm enough

during early days of their life. The brooding floor temperature should be in the range of 90-95° F and the minimum air temperature should be in the range of 90°F. Several factors may affect the brooding temperature during the winter months. Low brooding temperature leads to chilled chicks where they tend to huddle together and results in increased mortality. When the brooding temperature is low, the chicks use the feed energy to keep them warm, which results in poor feed conversion ratio. It may lead to metabolic problems such as ascites at later stages of the life. The chilled chicks will become immunocompromised and poorly perform throughout their life. Even after brooding, it is important to provide the necessary heat to maintain the temperature of the poultry house. Different heating systems are available for efficient heating which includes conventional brooders (Fig. 2), radiant brooders (circular open-flame and rectangular open-flame), radiant tube heaters (closed-flame), forced air furnaces, and high intensity radiant heaters. Propane is commonly used to heat the poultry houses.

### Few tips to maintain effective temperature inside the poultry house:

1. **Winter brooding:** Prepare the poultry house in advance to receive the day-old chicks. Preheat the litter at least 2 days before the arrival of chicks.
2. **Check chick's feet:** Asses the chick's feet for coldness. Place the chick's feet at your neck and feel it. It must be warm enough. In case, if they are cold which means they are chilled.
3. **Visual observation:** Visual observation is one of the easiest way to assess the spread of chickens in the poultry house. If the chicks are huddling under the brooding stove then the temperature might be low. Adjust the heat source accordingly and check for uniform distribution of chicks. In growing chickens, look for uniform distribution of the chickens throughout the farm.
4. **Insulation:** Proper insulation of the poultry houses helps in maintaining the temperature. Poultry house with poor insulation fails to maintain temperature because they conduct heat from inside the house towards external environment. The insulation might be damaged due to birds, physical activities, weather changes, pest infestation etc. So, always pay attention in checking the insulation of the wall. If you notice any damage, seal it properly.

- Side wall curtains:** Check the side wall curtains and curtain pockets for any damage. If any damage was noticed, fix it properly. It is preferred to keep half house curtain tight.
- Poultry house tightness:** A tight house helps in saving energy. Therefore, our goal is to maintain a tight poultry house. The tightness of the poultry house could be checked by conducting negative pressure tightness test.
- Monitor the temperature of the house:** The temperature of the poultry house needs to be monitored at different locations of the house. There are several equipment available to monitor the temperature. Using an infrared thermometer gun (Fig. 3) is an easy way to monitor the temperature. Electronic temperature data logger devices are available, which can record the temperature as well as the relative humidity of the house.

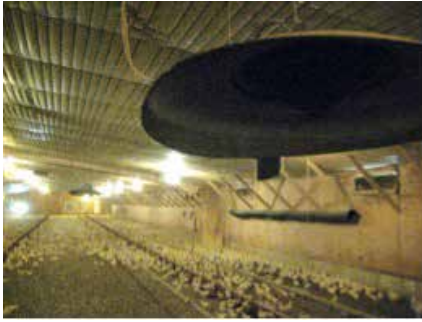


Fig. 2: Pancake brooder



Fig. 3: Infrared thermometer gun

### Air Quality

The air quality primarily depends on the exchange of the air between the poultry house and external environment. The main objective during winter is to allow the fresh air to enter the poultry house from external environment and remove the gases generated in the poultry house. During winter season, minimum ventilation need to be practiced where the fans would be operated at certain periodic intervals during day and night times. Oxygen, ammonia, carbon dioxide, and carbon monoxide are the predominant gases that determine the air quality. The dust level in the farm affects the quality of air. Fresh air entering the poultry house has oxygen (21.6%). Carbon dioxide, carbon monoxide and ammonia are the gases generated inside the poultry house (Tab. 1). Chickens and heating elements in the poultry house generate carbon dioxide. In addition, the heating elements produces carbon monoxide after consuming oxygen for its function. Uric acid excreted by the chickens undergoes enzymic degradation in the litter and ammonia is produced during this process. Generally, ammonia concentrations at the night time might be higher than the day time since the night time ventilation rates are lower than the daytime ventilation rates. Increase in ammonia (>30 ppm) damages the cilia of the tracheal mucosa. Cilia are hair like projections seen on the inner side of the trachea (Fig. 4). Their main function is to protect the trachea from invading pathogens and dust particles. Tracheal ciliary damage makes the chickens more susceptible for bacterial respiratory diseases (Colibacillosis, Chronic respiratory disease) and viral respiratory diseases (Infectious bronchitis, Infectious laryngotracheitis). High level of ammonia (>60 ppm) could affect the eyes of the chickens causing corneal ulceration, uveitis and keratoconjunctivitis. High levels of ammonia causes stress in chickens and negatively affect the feed conversion ratio, growth rate, body weight, immune status, meat quality, egg production, egg weight and increases the susceptibility to infectious diseases.

Gases generated inside the poultry house	Desired level
Ammonia	Ideal <10 ppm. Should not exceed 25 ppm.
Carbon dioxide	Ideal <3500 ppm. Should not exceed 5000 ppm.
Carbon monoxide	<20 ppm

Tab. 1: Desired level for gases generated inside the poultry house

### Few tips to maintain effective temperature inside the poultry house:

- Minimum ventilation:** Adjust the timer settings for the ventilation fans to follow minimum ventilation during the winter period. A tachometer could be used to monitor the speed of the fans. Laser tachometers can be used where the infrared light is used to measure the speed of the fans (Fig. 5)
- Inlets:** Adjustable sidewall inlets (Fig. 6) are preferable as it helps in adjusting the fresh air volume entering the poultry house. The sidewall inlets must be faced upwards so that the fresh cold air entering the poultry house is treated at the top before it hits the chickens on the ground. If the adjustable sidewall inlets are facing downwards, then the cold air entering the house might directly fall on the chickens and cause chilled chickens.
- Circulation fans:** Check if the circulation fans (Fig. 7) are functioning properly. Circulation fans helps in mixing the fresh air with in-house air. It helps in saving energy costs by utilizing the heat generated inside the poultry house and thus have an impact on fuel energy savings. It helps in removing the ammonia by reducing the litter moisture.
- Ammonia:** Lowering the ammonia level in the house helps in better performance of the chickens. Controlling the moisture level and reducing pH of the litter helps in minimizing the ammonia level in the poultry house. The ammonia level could be checked by Hydrion Ammonia test paper or using electrical meters.
- Carbon monoxide/ carbon dioxide:** Increased level of carbon monoxide and carbon dioxide causes detrimental effects to chicken health. Use carbon monoxide/ carbon dioxide meter for monitoring the carbon monoxide/ carbon dioxide gas level in the house.
- Air quality:** Periodically check the air quality. Use gas detector tubes (Fig. 8) to find the air quality. It is a quick and easy test that could be performed inside the house with immediate results. Gas detector tubes has a colorimetric gas detection system in which the color changes accordingly based on the concentration of the gas.
- Air flow:** Handheld weather meters could be used to measure the air speed, temperature and relative humidity (Fig. 9a, b)
- Alarm system:** Install and monitor alarm system to monitor any power failures or other issues.

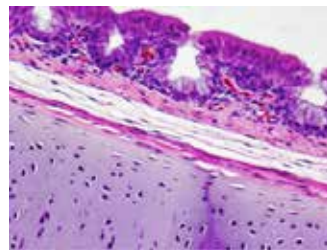


Fig. 4: Histology of Chicken Trachea



Fig. 5: Laser Tachometer



Fig 6: Adjustable sidewall inlet



Fig 7: Circulation fans



Fig 8: Gas detector tubes



Fig. 9 a, b: Portable wind meter

### Humidity/Moisture

Humidity maintenance is one of the important management factors that needs close attention during winter. The two main reasons for increased humidity in poultry houses is due to chickens and management issues. Chickens do not have sweat glands. Chickens lose water through direct losses such as urine, feces, and indirect losses such as panting. So carefully monitor the gut health of the chickens as it could be affected due to several reasons. Change in the nutritional diet, inclusion of certain cereals in the diet or anti-nutritional factors may cause enteritis. Bacterial infection caused by *Escherichia coli* and *Clostridium perfringens* may cause enteritis. Parasitic diseases such as coccidiosis causes bloody diarrhea in chickens. Viral diseases such as Runtting Stunting Syndrome causes severe flushing in the chickens. Relatively, healthy kidneys are important for normal excretion. Viruses such as avian nephritis virus and nephrotropic strains of Infectious bronchitis virus affects kidneys and causes severe flushing in chickens. Mycotoxins such as ochratoxin A, citrinin and oosporin are nephrotoxic. Management issues such as dripping, nipple drinkers, breakage in water pipelines could add more water inside the house. Any structural damage to the poultry house may get rainwater or snow melts inside the house. Condensation could be another reason for getting water into the house. Condensation occurs when warm air circulating inside the poultry house contacts with the cold surface such as concrete stem walls and exhaust fans. Any type of moisture added to the building is absorbed by the litter and makes it wet. Increased ammonia levels are noticed in houses with wet litter.

Wet litter issues cause more problems to the poultry health such as footpad ulceration, cellulitis and breast blisters. Wet litter then turns into caked litter (Fig. 10) which traps moisture in it. Maintaining the litter moisture at 20-30% would be ideal.

### Few tips to maintain effective humidity inside the poultry house:

1. **Drinker management:** Check the water pressure in the pipelines. Also, check the water pipelines and nipple drinkers for any leaks. If any leaks were identified, fix it immediately.
2. **Structural damages:** Check the house for any structural damages that might have caused due to rain, storm, pest or animals. Structural damages need to be taken care immediately.
3. **Gut and renal health:** Ensure proper gut and renal health for the chickens. Leaky gut and functionally impaired kidneys are problematic. Identify the reason for health issues and control it as soon as possible.
4. **Humidity of the poultry house:** It is good to maintain the house in a humidity range of 50-70%. Increased humidity causes elevated ammonia level in the poultry houses. Reducing the moisture level in the litter helps in keeping the ammonia level in control. Proper heating and ventilation helps to remove excess humidity inside the house.
5. **Stocking density:** Ensure the stocking density of the chickens housed. High stocking density interferes with the airflow in house. It also increases the moisture content of the litter.
6. **Litter management:** Decaking the caked litter, helps in removal of the moisture. If the litter is very wet due to any water leakage, replace the wet litter with dry litter. Several adsorbents and inhibitors of ammonia could be used for effective litter management.
7. **Assess litter moisture:** It is good to maintain the litter moisture between 25-40%. If the moisture level is below 25% it causes dusty environment which predisposes the chickens to certain respiratory infections. If the moisture level is above 40%, it increases the ammonia level in the farm. Practical estimation is a simple test to assess the litter moisture. Squeeze the litter near the drinker. If it clumps together then it indicates that the litter is too wet and if it falls apart immediately then it indicates that the litter is too dry. If the litter slightly adheres and then falls apart then it could be considered as right level of moisture.
8. **Equipment to measure humidity:** Hygrometer could be used to measure the humidity. Thermo-Hygrometers serve as dual purpose where it helps in measuring temperature and humidity (Fig. 11) Portable wind meters could also be used which measures humidity, temperature and windspeed (Fig. 9 a,b).



Fig. 10: Caked litter in a broiler house



Fig 11- Thermo-hygrometer

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