

In-shed sprinklers for cooling and activity promotion: a trial in progress

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Introduction

A trial of a sprinkler system for use in meat chicken sheds is in progress and data analysis is yet to be completed. The information provided here is based on preliminary observations with installing and operating the system at two meat chicken farms in southeastern Queensland. Our aim was to get experience with in-shed sprinklers in an Australian context. They are already being used extensively in parts of the USA.

Background

Low-pressure sprinklers have previously been used in meat chicken sheds. These systems cooled the birds but made floors wet because they were manually operated or used basic timers and simply applied too much water. Recent development of precise sprinkler control systems has enabled low-pressure sprinkler systems to be re-considered as a means of keeping meat chickens cool during warm weather.

Information is available on the development and testing of sprinkler cooling systems for meat chickens and the use of surface wetting as a means of cooling meat chickens (Berry et al., 1990; Czarick and Fairchild, 2017a, b; Liang et al., 2010; Liang et al., 2014a; Liang et al., 2014b; Tabler et al., 2008; Tao and Xin, 2003). Some of the reported differences between direct surface wetting using low pressure sprinklers compared to evaporative cooling pads include:

- Significantly less water used for cooling (50-85% less water)
- Lower in-shed humidity during cooling
- Similar litter conditions, tending towards drier litter
- Slightly more electricity use for ventilation fans (about 4-5% more)
- Similar bird growth, FCR, mortality
- Lower installation cost.

Methodology

Sprinkler systems (Weeden Sprinkler System[®], Weeden Environments[®], Canada) were installed on two meat chicken farms in southeastern Queensland (2 systems on one farm and 1 system on the other farm). Sensors were installed to measure in-shed temperature and relative humidity, and water meters were installed on the evaporative cooling pad systems and sprinkler systems to record water use. Our focus was potential water savings, litter conditions, temperature, relative humidity and how the birds respond to direct water spraying.

The sprinkler systems were installed as per the manufacturer's instructions. In summary, two PVC pipes were installed along the ceiling, running the full length of the shed, approximately 3.5-3.7 m from the side walls. Sprinklers were suspended every 6 m along these pipes. The system was installed with two sets of independent temperature sensors and solenoid valves in the front and back halves of the shed. This enabled the temperatures at both ends of the shed to be monitored and sprinklers activated according to the conditions.

The sprinkler controller was operated for both ‘activity promotion’ and ‘cooling’ (Figure 1). Activity promotion started after day 14 and provided regular application of water regardless of air temperature to stimulate bird movement and feeding. In this mode, sprinklers were activated for 10 s every 60 min during daylight hours. Cooling mode activated as required based on temperature, but only between 9am–10pm after day 21. Frequency of water application automatically increased as the in-shed temperature became warmer, with temperature set-points decreasing during the grow-out. Evaporative cooling pad usage was reduced by increasing temperature settings in the existing shed ventilation controller. Growers were encouraged to adjust the settings based on their assessment of bird thermal comfort and weather conditions if required. All settings within the sprinkler controller were adjustable by the grower (days, times, temperature set points, sprinkler duration and frequency etc).

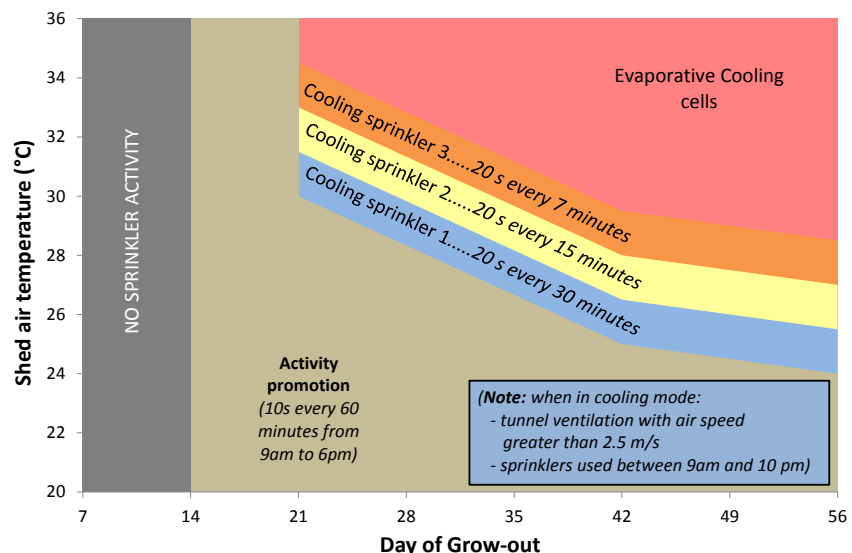


Figure 1. Example configuration of the sprinkler controller in activity promotion and cooling modes when used in conjunction with evaporative cooling pads

Discussion and conclusions

This project is about half completed, and so far, we have observed the following:

- Litter is not consistently wetter with the use of the sprinklers.
- Growers have coordinated the sprinkler and ventilation controllers to delay the use of evaporative cooling pads. Water savings depend on how much the grower wants to rely on the sprinkler system for cooling. Water savings of up to 35–78% have been observed.
- In-shed relative humidity is lower, and air temperature is higher, when using the sprinklers compared to evaporative cooling pads. The birds appear equally comfortable.
- Installation in Australian sheds may need to consider sprinkler position in relation to ceiling baffles.

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