The University of Georgia
Cooperative Extension Service
College of Agricultural and Environmental Science/Athens, Georgia 30602-4356

Poultry Housing Tips

Temperature and Relative Humidity...Part 2

Volume 9 Number 6 **May, 1997**

Last month's *Poultry Housing Tips* discussed the relationship between outside temperature and relative humidity. Namely, as outside temperature increases, relative humidity decreases. Since relative humidity decreases as air temperature increases, the amount of cooling a pad or fogging system will produce increases throughout the day as temperatures climb. Weather data for two locations in Georgia (Athens in North Georgia, and Alma in Southeast Georgia) during the summer of 1993 and 1994 were used for the purpose of illustrating the relationship between temperature and relative humidity during warm weather.

There are probably a few people who after reading last month's issue believe where they live is much more humid than either of the locations described in that issue, and that in fact there are times when the temperature is over 90ºF and the relative humidity is over 80%. So for those of you who still do not believe, summertime temperature and relative humidity data were compiled for a couple of locations in a state that is known for its humidity: Louisiana. The two locations examined were Lake Charles (approximately 40 miles from the coast in the southwest corner of the state) and Shreveport (in the northwest corner of the state).

The first thing that becomes apparent when examining the temperature/relative humidity data is how similar the weather in Louisiana is to that of South Georgia. For instance, during summer of 1993 between the hours of 9:00 am and 10:00 pm, the average temperature was 86.1ºF in Alma, 89.1ºF in Shreveport, and 86ºF in Lake Charles. When the air temperature was 90ºF, the relative humidity ranged from the forties to the sixties in the Louisiana locations and South Georgia (Table 1). When air temperatures increased to 95ºF, percent relative humidity ranged from the high thirties to the mid fifties (Table 2).

Range of Relative Humidity at Air Temperature of 90ºF		
Location	Low	High
Alma, Ga	37%	66%
Shreveport, La	45%	65%
Lake Charles, La	48%	68%
Athens, Ga	29%	62%

Table 1. Range of Relative Humidity

Range of Relative Humidity at Air Temperature of 95ºF		
Location	Low	High
Alma, Ga	35%	56%
Shreveport, La	34%	55%
Lake Charles, La	38%	52%
Athens, Ga	22%	48%

Table 2. Range of Relative Humidity

Though relative humidity always decreases as outside temperature increases no matter where you are, this does not mean that some places aren't more humid than others. In Tables 1 and 2, it can be seen that the relative

humidity in Athens is generally lower than that in South Georgia or the two locations in Louisiana. In fact, during the summer of 1993 between the hours of 12 pm and 6 pm, though the average temperature was fairly similar in all four locations, the average relative humidity was 10 to 20% lower in Athens than for the other three locations (Table 3).

Average Temperature and Relative Humidity(12 pm to 6 pm) Summer 1993

Location	Temperature	Rh
Alma, Ga	89.3°F	56%
Shreveport, La	90.6°F	56%
Lake Charles, La	87.7°F	63%
Athens, Ga	89.7°F	46%

Table 3. Average Temperature and Humidity

Since the relative humidity was on average higher in Louisiana and South Georgia than Athens, the average cooling produced by a fogging system in a broiler house in Louisiana and South Georgia would have been lower, by approximately two to three degrees (Table 4). But, the fact remains that when it is 90 F, a good fogging system can still reduce the temperature six to eight degrees in any of the four locations.

Average Inside and Outside Temperature in Broiler House with Fogging Nozzles (12 pm to 6 pm) Summer 1993

Location	Outside Temp	Inside Temp	Cooling
Alma, Ga	89.3°F	82.9°F	6.4°F
Shreveport, La	90.6°F	84.1°F	6.5°F
Lake Charles, La	87.7°F	82.4°F	5.3°F
Athens, Ga	89.7°F	81.5°F	8.2°F

Table 4. Average Cooling Produced by a Fogging System.

(The cooling produced by a 2" fogging pad system can be obtained by multiplying the table cooling values by 1.2. Multiply the table cooling values by 1.6 for a four or six inch cool cell system)

As noted in last month's *Poultry Housing Tips*, the amount of cooling a fogging system will produce when it is 90°F outside will vary from day to day as weather fronts move in and out of an area. Tables 1 and 2 indicate a possible variation in relative humidity of up to 20 to 30% for the four locations when air temperatures are in the 90's. This is fairly typical of most areas of the U.S. where poultry are grown. So, during the summer of 1993, when it was 90°F a fogging system in Shreveport could reduce house temperature by as much as 8.7°F on some days and as little as 5°F on others. Athens tends to be a slightly dryer climate so there is a wider variation in the amount of cooling a producer might expect on a 90°F day, from a high of 11.6°F to a low of 5.5°F degrees cooling (Table 5).

Temperature Reduction Produced By a Fogging System (Air Temp. = 90°F)

Location	High	Low
Alma, Ga	9.9°F	4.8°F
Shreveport, La	8.7°F	5°F
Lake Charles, La	7.9°F	4.5°F
Athens, Ga	11.6°F	5.5°F

Table 5. Max. and Min. Temperature Reduction

Temperature Reduction Produced by a Fogging System (Air Temp. = 95°F)

Location	High	Low
Alma, Ga	11°F	6.9°F
Shreveport, La	11.2°F	7°F
Lake Charles, La	10.4°F	7.6°F
Athens, Ga	14°F	8.4°F

Table 6. Max. and Min. Temperature Reduction

It is of interest to note that during the summer of 1993 when the air temperature was 90°F, the lowest amount of cooling a fogging system would produce was 4.5°F. That was true in all four locations. Thus it is possible in all four locations to lower the temperature of the house to approximately 85°F. With good air movement, 85°F is tolerable.

Since relative humidity decreases as outdoor temperature increases, the cooling produced by a fogging system increased at all four locations when air temperature climbed to 95°F (Table 6). For instance, when the air temperature was 90°F in Shreveport, the least amount of cooling a fogging system would produce was 5°F. But, when temperature increased to 95°F, the least amount of cooling fogging system would produce was 7°F, decreasing house temperature to 87°F.

In the preceding tables it can be seen that there is a range of cooling a fogging system can produce on any given day. In the morning when the temperature is relatively low and the humidity is high, a fogging system may only produce a few degrees of cooling. But, in the afternoon as temperature increases and the humidity falls, a fogging system can reduce the house temperature ten degrees or more. Furthermore, some days are more humid than others. On one 90°F afternoon a fogging system may produce ten degrees of cooling and on another only six.

Since the amount of cooling a fogging system can produce varies from hour to hour as well as from day to day, it stands to reason that the amount of water which will evaporate from a fogging system will vary similarly. For instance, in Athens when the air temperature was 90°F during the summer of 1993, the amount of cooling a fogging system could produce varied from 5.5°F to 11.6°F because of differences in relative humidity. On more humid days less water could be evaporated so less cooling was produced. Conversely, on drier days, more water could be evaporated into the air so more cooling was produced. With a fogging system, the fog which is added to the air and does not evaporate ends up in the litter. Therefore, in order to minimize house wetting, it is very important that a producer have some ability to control the amount of fog which is added to the air. For instance a fogging system may be set up so that on extremely hot and dry days all of the nozzles could be used. On normal hot days, two thirds of the nozzles could be used and on extremely humid days one third could be used. The average broiler house with a single stage fogging system typically has enough nozzles for the average summer day. On more humid days, wetting occurs because too much water is being added. On hotter, drier days, the birds may be heat stressed because not enough fog is being added.

In conclusion:

1) As a day progresses and the air temperature goes up, relative humidity goes down, and the amount of cooling a fogging system can produce increases.
2) When the air temperature is 90°F or higher, you can always use your fogging system to reduce house air temperature, no matter where you live.
3) If it is a hot humid day and evaporative cooling is limited, do not turn off your fogging system, just use fewer nozzles. You will cool your house and keep litter wetting to a minimum.
4) The amount of cooling a fogging system will produce is limited when the humidity is above 80%. This fact should have little effect on whether you operate your fogging system considering that when the air temperature is above 85°F, the relative humidity is always below 80%.

Michael Czarick
Extension Engineer
(706) 542-9041
(706) 542-1886 (FAX)
mczarick@engr.uga.edu

Michael P. Lacy
Extension Poultry Scientist

Provided to you by:

Publication of this newsletter is supported by funds granted to the DOE pursuant to the provisions of public law 94-163