

Brooding Systems in Poultry Farm a Review

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Abstract - Increase in price of fuel has put burden on poultry farm, specially for small scale poultry farmer. The heating systems which are available are gas brooder, electric brooder, and charcoal brooder. Due to high operating cost of gas brooder and lower efficiency of electric and charcoal brooder they become absolute. Change in temperature up to 0.5° to 1° will impact on fully growth of chick. As, the life of chicken gradually increases the requirement of temperature decreases in the range of 35° to 25°. During winter season the temperature play important role for growth of chick, if they use their internal energy for producing heat then their weight cannot increase hence there is need to maintain the temperature of poultry house. To overcome the high operating cost of available brooder there is need of heating brooder which has low operating cost and operate on fuel which will available easily.

Key Words: Brooder, Poultry farm, Economical Brooder, monitoring, Relative humidity, Chicken, etc.

1. INTRODUCTION

Poultry is one of the developing sector in India. It requires low capital investment and can be secondary economic source for people. Now a days rapidly increasing fuel and feed cost is a serious issue for poultry farm owners. Health, growth and minimum feed consumption are essential things for chicken. Due to conduction, convection and radiation in poultry farm huge amount of losses are created. These all factor can be achieved by maintaining proper atmosphere as chicken cannot maintain their own body temperature. Brooding is necessary to provide artificial heat to chickens for maintain their body temperature with atmospheric temperature.

India ranks third in egg production and seventh in chicken meat production in the world. The Poultry Industry is contributing about Rs.70,000/- crore and providing employment to more than 4 million people either directly or indirectly. This industry is developed in certain area of the country. The State like Andhra Pradesh, Telangana, Tamil Nadu lead the country followed by Maharashtra, Punjab and West Bengal.[1]

The total meat production has increased from 2.24 Million Tones during 2015-16 in rainy season to 2.43 Million Tones during 2016-17 in same season recording a growth 8.74%. As against the targeted production of 7.37 Million Tones during 2016-17, the total estimated production in two seasons, summer and rainy, is 4.67 Million Tones

showing an achievement of 63.28%. Nearly, 47.86% of the meat production is contributed by poultry.[2]

Chicken are homoeothermic means they maintain constant body temperature despite of change in environmental temperature. It is not possible for chicken to maintain own body temperature and gain more weight at same time during rainy and winter season.[3]

Now a days in India today there are various technologies adapted in this sector for maintaining the required temperature of poultry house this can be achieved by using gas brooder, electric brooder, pot charcoal brooder etc. But there are some disadvantages of these system such as high operating cost, health issue of chicken & high capital investment. There is scope to overcome above problems.

2. ALTERNATIVE BROODING SYSTEMS

2.1 Gas Brooder

Gas brooder uses LPG gas as a fuel for heating operation. If cost considerations are neglected then it can be most beneficial brooder as it install with proper setup (sensors, exhaust system, control panel, etc). As this is fully automated system there is no need of extra man power. Some limitations of this system are, Initial & working costs are too high so cant affordable for small scale farmers. There is problem of improper electric supply in rural areas so it can cause stopping of system. Continuous increase in price of LPG gas cylinder affects working cost.

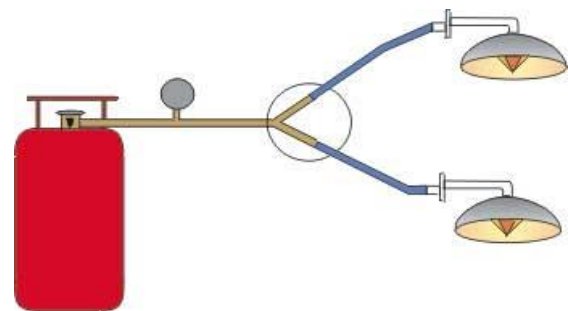


Fig -1:Gas Brooder[4]

2.2 Radiant Tube heater

Radiant tube is use for heating purpose. It covers large space with radiant heat. Require less amount of electricity. Floor area can't require as system installed at the sealing. Simple exhaust system can be use.

Disadvantages are Overheating can occur. Temperature variation along tube length. Discontinuous power supply can cause problem.



Fig 2- Radiant Tube Heater[5]

2.3 Solar Heating System

Black absorber used to concentrate sunlight, which converts sunlight to heat. Due to Renewable source of energy this system is eco- friendly. Energy can be stored and used whenever it requires. But it has some limitations as, high initial cost, maintenance require, accessories cost, temperature variation may occur due to change in climate.

1.Design for temperature controlled solar heated chick brooder

In this paper Okolie Paul Chukwulozie conclude following results:

1. For several chicks temperature require to maintain is lower.
2. Chicks can keep warm each other.
3. Temperature control require between 34° to 24°.
4. Heating not require if temperature in maintain.
5. Regulation require if temperature is near to require temperature.

Determination of amount of charcoal used in pot charcoal chicken brooder by evaluating heat generation capacity and survival of chicken.[6]



Fig 3- Solar Heating System[7]

2.4 Under Floor Heating

This system depends on conduction, radiation and convection as means of heat transfer. Under-floor heating system are using underground electric heating and underground pipes for heat transfer. This system require external boiling and cooling system as it provide heating and cooling. But this system require more space and high installation cost.[8]



Fig 4-Under Floor Heating[9]

2.5 Trombe Wall Poultry Chick Brooder

Trombe wall form an integrated part of the house duly oriented south ward for maximum solar energy collection all year around this is made of 0.22 m thick solid block to form the thermal storage system external surface of wall which is expose to environment is treated with black paint for the absorption of radiation energy from sun. Glazing through the glass reduce excess heat loss from long wave radiation.[10]



Fig 5- Tromb Wall Poultry Chick Brooder[11]

2.6 Kerosene Brooder

Kerosene brooder plays important role in rural and remote area. This system requires 40 lit kerosene per day for approx 1000 birds. Lamps are used in kerosene brooder for brooding operation.

It creates health issue for chicken. Also availability of Kerosene may create problem. Requirement of cost is more.



Fig6- Kerosene Brooder[12]

2.7 Pot Charcoal Brooder

In this brooder charcoal is used as heat source which applicable to remote & rural areas. Charcoal brooder is widely used since it is easily available & has low cost. In the economic sense charcoal is very efficient fuel. It burns easily & for longer period

Along with such benefits it carries some disadvantages that are, It creates smoke in high quantity which is harmful to chicken's health. In rainy season there is higher possibility that charcoal may get wet due to rain so proper care of storage is needed. Charcoal takes some time for initial heating.

Introduction and evaluation of pot charcoal chicken brooder applicable to remote and rural areas.

In this paper Mulugeta Ayalew conduct experiment on 60 chickens by using pot charcoal brooder, positive control electric brooder and negative control brooder over 15 days time period and Mulugeta Ayalew conclude following Results:

1. No deaths of chicken brood by pot charcoal brooder.
2. Observe highest deaths on second day of testing period.
3. Chicken without providing external heat were died.
4. In night more chicken died.
5. No regular electric supply in rural area.[13]



Fig7-Pot Charcoal Brooder[14]

3. Parameter which to be consider to reduce the heat loss of poultry farm

1. Avoid air leakage
2. The roof and wall should be fully sealed
3. Providing well sealing brooding curtains
4. Minimizing over ventilation
5. Monitoring abnormal heat rate of consumption
6. Enhance insulation: it is used to reduce heat transfer i.e. heat gain in summer and heat loss in winter
7. Regular maintenance and inspection of heating system

4. Environmental parameter

Relative humidity (RH), CO₂ and ammonia (NH₃) plays very important role in growth of chicken. Proper ventilation require to control all these parameter. If RH exceeds above 70% then it will create undesirable effect & RH below 50% creates dust in poultry house. Modern techniques are trying to reduce heat losses for maintaining temperature of poultry farms. Due to this formation of CO₂ takes place. Gas heater helps in formation of CO₂ & also birds create their own CO₂. High level of NH₃ create impact on growth of chicken. It reduce rate gain of weight of chicken. Different rate of NH₃ production in farm gives different rate of growth. Various factors affects the rate of production of ammonia i.e. ambient temperature, ventilation rate, humidity, composition of food etc.[15]

4.1 Relative humidity:- Relative humidity of over 70% is undesirable and should be contained through use of ventilation. RH level below 50% result in higher production of dust and air born microorganism. During summer bird experience discomfort due to high relative humidity combined with high temperature.[15]

4.2 Carbon dioxide:- Modern poultry housing is designed and constructed to reduce heat loss and improve energy

efficiency but when combine with reduction in ventilation to prevent loss of heat energy .this can result in increasing CO2. Two main sources of CO2 are from gas heater and from the bird themselves.[15]

4.3Ammonia:-Increase in NH3 concentration level in poultry can be caused by high moisture level along with high temperature which promote bacterial growth & cause organic material to decompose. NH3 level should not exceed 20ppm over 8hr period or 35ppm over in10 min period during poultry production cycle.[15]

Monitoring environmental parameters in poultry production facilities

In this paper Dr. Gerard Corkery conclude following results:

1. For high performance rate and low energy cost monitoring and analysis system is needed.
2. Modern brooding system should work on their effectiveness and levels of savings.
3. Farmer facing problem of high heating cost.
4. Producer moved from price setter to price taker.
5. Recommended temperature for Ross birds for first 15 days of life period is as follows:0 to 6 day - 32° to 35°, 7 to 13 day- 28° to 31°, 14 day -25° to 27°. [15]

5. Need of exhaust system

In order to reduce energy loss the ventilation is avoided in traditional method but it result in increase in co2 and RH which affect on growth and development of chicken. So as to avoid it proper exhaust is needed in poultry farm. It is necessary to throw NH3 out of poultry farm in order to avoid microbial growth.

6. Necessary considerations of Brooding system

1. Per unit installation cost
2. Efficiency of overall heating system
3. Consumption of fuel
4. Cost of fuel
5. Heat distribution
6. Number of unit require
7. Overall heating system efficiency
8. Availability of required fuel
9. Daily maintenance and its cost
10. Housing space[8]

7. CONCLUSIONS

1. After installing brooder in poultry house productivity of farm increases.
2. Implementing brooder in small poultry farms with low initial cost help poultry industry in India.
3. Health of chicken mainly depends on surrounding condition hence brooder makes it possible.

4. In rural areas poultry farmers still not using brooder because it is costly hence their productivity is low by providing them economical brooder increases their profit.

REFERENCES

- [1] R.N. Chatterjee And U. Rajkumar, An Overview Of Poultry Production In India, Indian J. Anim. Hlth.(2015),54(2):89-108
- [2] http://www.business-standard.com/article/economy-policy/india-s-meat-production-rises-8-48-in-july-october-2016-17-117021601073_1.html
- [3] Space Heating in Poultry Production-Alberta Government
- [4] <http://www.dhumal.com/img/in-img/gasinst.jpg>
- [5] http://www.spaceray.co.uk/uploads/gallery/large_131.jpg
- [6] Okolie Paul Chukwulozie, Design for temperature-controlled solar heated chick brooder, International Journal of scientific and engineering research,volume3,issue 4, April-2012,ISSN 2229-5518.
- [7] https://insolare.com/wp-content/uploads/2017/02/IMG_20160724_182353.jpg
- [8] Energy-efficient heating in poultry shades-NSW department of primary industries.
- [9] <http://www.ecotecservices.co.uk/images/layout/under-floor-heating-systems02.jpg>
- [10] W.I. Okonkwo and C.O. Akubuo, Trombe wall system for Poultry Brooding, International journal of poultry science 6(2):125-130,2007.ISSN 1682-8356.
- [11] <http://ncerd-un.gov.ng/images/ncerdpixs/chickenbrooder.jpg>
- [12] <http://anamericanhomestead.com/wp-content/uploads/2014/08/brooding-chicks2.jpg>
- [13] Mulugeta Ayalew, Introduction and evaluation of pot charcoal chicken brooder application to remote and rural areas. American-Eurasian J. Agric. and environ.sci.,12(2):188-191,2012.ISSN 1818-6769,IDOSI Publication,2012.
- [14] <http://assets.fwi.co.uk/7309435-brooder.jpg>
- [15] Gerard Corkery, Monitoring Environment parameter in poultry production facilities-Computer Aided Process Engineering, CAPE forum 2013,Graz University of Technology,Austria,7-10 April 2013.