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AIR CONDITIONING AND VENTILATION OF COW SHADE

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Abstract— Milk production of cows reduces due to the change in environmental conditions. In the summer the as the temperature of surrounding is more than the comfort conditions of cow, hence in the summer season decrease the milk production and re-productivity etc. In summer, from March to June the increase temperature and reduce humidity due to heat stress developed in the cow body. Genetic progress in milk production is closely related to increase feed intake. This case is taken for the study in this project for providing the comfort conditions for cow and increase the milk production. This study is concentrated to keep the temperature and humidity within the comfort limit by providing effective cooling by using mist evaporative cooling. By providing cooling cow increase milk production, improve health of cows. Hence increase the profit of the plant

Keywords— Heat, Stress, Temperature, Humidity,Sweating, Moisture, comfort

Introduction

Cow comfort has tended to concentrate on genetic improvements to Increase milk production and on the thermal environment is a major factor negatively effect. Dairy ability of the modern cow as her capacity to produce Milk has increased. Decreased in milk fat and protein is the most important milk composition changes under heat stress condition. By providing cooling decrease the water intake per day per cow saving water use for Mist fan.

Lowering the environmental temperature by modifying the Structure of the shade where the cows are kept by introducing cooling facilities. Heat loses from animals by sprinkling them with water using sprinkler. Thermo neutral zone is defined as the zone of minimal heat production at rectal temperature. Out of this zone, some disturbances will be observed. (Fig. 1) illustrate this concept.Air moisture increases the rate of evaporation heat loss from dairy from a dairy cows under high temperature conditions, therefore dairy cow performance falls markedly in hot and humid summers.

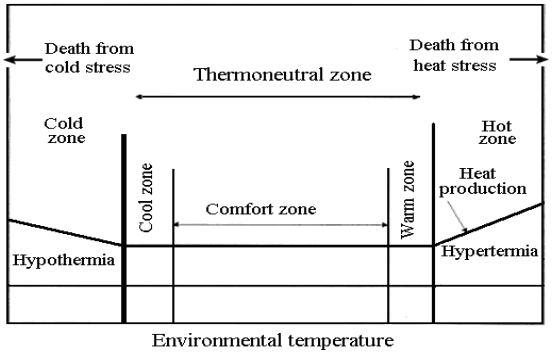

Fig.1 Schematic figure of thermo neutral zone and comfort zone (Adapted from Curtis, 1981)[1]

II. CLIMATE

The American Southwest (as well as parts of Africa, Asia, and the Middle East) is dominated by a type of climate classified as "arid" or "semi-arid," which is characterized by extremely hot and dry summers. The dairy cows raised in such a climate are, on average, more greatly affected by heat stress than cows raised in cooler climates. However, because of the low relative humidity (RH), evaporative cooling is very effective.

For example, at 104°F and 15% RH, an evaporative cooling system operating at 75% evaporation efficiency will reduce the temperature by almost 25 °F

Due to its effectiveness, evaporative cooling often also makes sense economically. An economic analysis showed that implementing high-pressure misters mounted on fans can reduce the overall costs of heat stress by well over 45%.

III. EFFECT OF HEAT STRESS DAIRY COW

Heat stress effect on dairy cattle in several ways and finally cause to decrease animal milk production and performance. Some of most important results of heat stress in dairy cows include: [5]

1. Some behavioural signs such as Seek shade refuse to lie down, in coordination, inability to move.
2. Increased respiration rate and laboured breathing, or panting.
3. An increase in heart rate and increased sweating.
4. Decreased blood flow to internal organs.
5. Some changes in digestion of food such as reduced or absent rumination (chewing of cud) and slower feed passage rate through digestive tract.
6. Decreased dry matter intake and feed intake.
7. Decreased milk production and milk quality.
8. Change in body hormones level and reproductive performance.

IV. BASIC STUCTURE AND LAYOUT

In dry lots, 45 to 50 square feet of shade should be provided per cow. Dry-lot shades are typically oriented North-South to maximize the distance their shadow moves during the day so that, as the animals move with the shade, the manure and urine they produce will be spread over a wider area and the abandoned ground can dry.The recommended height for dry-lot shades is 11 to 14 feet. Saudi barns are also constructed in dry lots and are typically around 105 feet wide, with 11- to 14-foot eaves and a 2/12 to 4/12 roof slope. They feature a central drive-through feed alley and feed lines that can be underlain by a concrete slab, but elsewhere typically have dirt floors (see figure 2). One advantage these structures have over basic dry-lot shades is that the cows do not have to leave the shade to access the feed line.

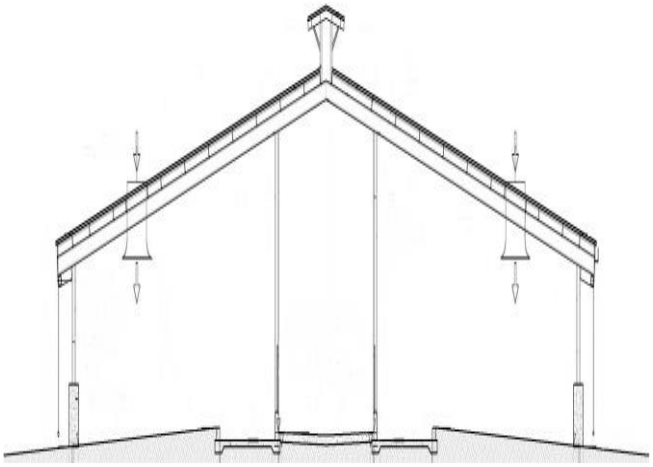

Fig. 2. Example Saudi-barn cross section (Courtesy of JGM III Dairy Design Team

V. METHOD OF PREVENTION OF HEAT STRESS

1. Increasing heat loss from animals by sprinkling them with water, using fans and so on.
2. Lowering the environmental temperature by modifying the structure of the shade where the cow are kept, or by introducing cooling facilities.
3. Increasing the efficiency of feed energy utilization, and reducing the heat increment of animals by feeding strategies.

Shade, fans, mist and fan systems, and night grazing, are presented as effective methods of modifying the environments of dairy cattle for prevention of heart stress in hot climate. Depend of the different climate; several different methods can be applied. In every method, we must cool cows and finally decline the cow's body temperature. For better understanding, we breakdown the different areas to four climate that include very humid, mild humid, low humid and very dry climates. Spray and fan systems can use for decline heat stress affects in humid areas.

Fans can increase the air movement and air movement increases the rate of heat loss from a cow's body surface, as long as the air temperature is lower than the cow's skin temperature. In climates with a low relative humidity, fog or mist systems (fine spray) usage provides evaporative cooling. These systems cool the air around the dairy cows.

VI. EVAPORATIVE COOLERS

Mounting fans and misters below a structure's eave is especially compatible with dry-lot shades (see figure 3). Some systems, such as Flip Fan (Schaefer Ventilation Equipment Corp., Sauk Rapids, MN) are also shade tracking. Shade-tracking systems offer the advantage of supplying cooling to the shaded area as it moves throughout the day. Besides providing the cows more comfort, this feature spreads manure and urine over a greater area and eliminates the need for a curtain to block afternoon sun. In addition, the Flip Fan can be adjusted to blow mist into the loafing area, where cows often rest at night. Recommended spacing varies by specific product. As an example, the recommended number of fans per truss, depending on its length, is shown for the FlipFan system

Fig 3. Flip Fan system cooling cows under a dry-lot shade

Increasing summer milk yield and fertility and reducing seasonality in milk supply to the dairy industry are among the main goals of dairy sectors in hot regions. In the last three decades, intensive cooling.

System and summer management practices were developed and largely introduced to the dairy Farm in these countries, among them, Israel. Extension services of the Israeli ministry of agriculture and the Israel Cattle Breeders Association cooperated to develop a computerized index based on the Israeli "Herd book" data, to evaluate the effectiveness of cooling cows in the summer.

This article presents how the summer: winter ratio index can be used as a tool to evaluate farm's Capabilities to combat summer heat stress and reduce summers negative impact of cows Performance

VII. ADVANTAGES

1. Increases milk production and re-productivity cow
2. Decreases heat stress
3. Increases fat to protein ratio and longevity
4. Reduce the labor cost
5. Increases the farm profit

CONCLUSION

Hot weather reduces milk production in cow with high genetic merit for milk production. In summer season by providing cooling system in the shade to increases the milk production, improving health of cow, longevity, re productivity etc. Use of management methods and nutritional ways for prevention the heat stress effects; reduce the heat stress effects in comfort condition. Climates and increase the cows performance and consequently increase the profitability

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