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A REVIEW

Role and importance of light in farm animals and birds

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Photoperiod is the most common environmental factor monitored by animals to alter long-term physiological processes, particularly reproduction and production through its effect on physical activity, hormonal regulation, behaviour etc. Lighting of animal premises is essential elements of animal (Mitev, 2012). Solar radiation directly or indirectly exerts a profound effect on the behavior of animals. In the form of visible radiation (light), the photoperiod governs diurnal and seasonal activity patterns of the animal. Photoperiod is important for the improvement of production efficiency and profitability (Dahl, 2005). A true photoperiodism response is a response to the changing day or night. Some species respond to increasing day lengths and decreasing night lengths this is called a long day response. Other species may exhibit the same response, to decreasing days and increasing nights; this is a shortday response. Sometimes a response is independent or nearly independent of day length and is said to be day-neutral.

Photoperiod for cow :

Long-day lighting usually increases dry matter intake (upto 6%) to supply the extra nutrients needed for milk production. Long-day photoperiod causes increase in milk production (Miller *et al.*, 1999; Stanisiewski *et al*., 1985; Phillips and Schofield, 1989; Bilodeau *et al.*, 1989 and Marcek and Swanson, 1984). Many authors reported about the importance of short day photoperiod during dry period causes more milk production (Petitclerc *et al.*, 1989 and 1998). There is no effect of light in the on fat composition in the milk (Dahl *et al.*, 2000). The initial response takes about 2-4 weeks to be seen. Higher light level causes the elevation of IGF-I in milk yield observed in cows on long days period (Dahl *et al*., 1997) and increase dry matter intake (Miller *et al.*, 1999). Todorov and Mitev (1995) reported that the short photoperiod during the dry period causes the more rapid body condition recovery. In case of heifer long day exposure to the light causes the early puberty (Hansen *et al.*, 1983 and Peters *et al.*, 1980). Light also play important role in the immune function in the body (Auchtung *et al*., 2001). Researchers have found that increasing light from less than 12 hours/day to 16-18 hours/day, increases milk production by 7-10 per cent. Milk composition in cows is generally unaffected by photoperiod, although slight depressions of milk fat percentage have been observed. The use of light in dairy animals suppresses the release of melatonin hormones (Rieter, 1991 and Illnerova and Sumova, 1997).Parenchymal cell number was greater in heifers exposed to long days during the prepubertal period. For dry cows, limiting light exposure to 8 hours/day can be achieved using well-ventilated, enclosed barns. Cows

can be exposed to natural daylight for up to 8 hours, but should be in darkness for the remaining 16 hours/day photoperiod is also important for prevention of Omega 3 fatty acid to 13-hydroxyoctadecadienoic (Blask *et al.*, 2004) and modulate blood system (Skwarlo-Sonta, 2002).

How light increases milk production? :

Photoperiod manipulation has effects on mammary development . The most important hormones related to the production in dairy animal melatonin is the active mediator of photoperiodic (Rieter, 1980). Long days also increase parenchyma cell number after puberty. Melatonin is a hormone produced in the cow's pineal gland. Melatonin hormones reduce the mammary gland growth (Sanchez-Barcelo *et al.*, 1991). Due to presence of light there is less production of melatonin. Melatonin supplementation during the summer season causes decrease in the prolactin hormones concentration in dairy animals (Auldist *et al.*, 2007). In cows, a long day pattern is associated with higher secretion of the hormone insulin-like growth factor-I . Higher IGF-I , in turn, is thought to increase milk yield. Bovine somatotropin (bST), which also increases milk yield, stimulates IGF-I release. Miller *et al*. (1999) treated cows with either long days or natural photoperiod, and half of each of those groups received bST as well. As expected, milk yield increased 1.9 L/d in the cows on long days.

Light for poultry :

Light manipulation is important role for production and growth in the poultry industry (Tucker and Ringer, 1982). In case of chicks provide continuous light for 0-8 week. At first the light under brooder will sufficient. Growers from 0-8 week should be reared in natural light only. It is always to better to expose the growers to a decreasing day length for delay sexual maturity. In layers begin to light to birds at 20 week for 10 per cent egg production. The age of lay is reached before 140 days in the absence of light stimulation (Lewis, 1996 and Lewis *et al.*,1997) Provide a total light of 16 hours light through natural or artificial light. When the birds have been lay in about 6 month it is usual practice to increase 1 hour to 17hours per days helps to stimulate production at a time when the birds are prone to sudden drop of production. Never expose the layers beyond 17 hours of light. Broiler chicks can be exposed to 20-23 hrs of continuous light at one and two days of age and then reduced to 18 - 20 hrs of light until processed Broilers kept under intermittent photoperiod perform better with respect to body weight, FCR, health etc. than those under continuous or restricted lighting. Birds in the red light spent more time in aggressive interaction, pecking at the floor and wing stretching. These activities were less common in birds reared in green or blue light. Birds in the red and white light spent longer sleeping, whereas birds in the green and blue lights spent relatively longer sitting and dozing, respectively. Walking activity was greatest in birds in white light and least in birds in green light. Male birds that had been reared in red and white lights gained more weight during the preference testing period than males reared in blue or green light however, the reverse was true for female birds.

Light for sheep and goat :

Goats and sheep are considered short-day breeders and when they are exposed to short periods of day light they are more receptive to breeding. Previously authors reported about the effect of light on the lactation of sheep (Bocquier *et al.*, 1990) and goats (Terqui *et al*., 1984). Controlling the amount of light the doe or ewe is exposed to can be used to induce estrus in the females. The males can be exposed to the same lighting regiment which should improve their sperm production, libido, semen quality and fertility. In a report with milk goats of either the Toggenburg or Sanen breeds, goats were milked three times daily with a lighting schedule of 16 h light and 8 h dark and infused with ovine prolactin, thirty minutes after each milking. Milk yield was slightly increased (0.5%), while milk composition and yields of milk components were not influenced by treatments. The amount of light the females are exposed to can be reduced gradually over an 8 to 12 week period.

Light for rabbit :

Rabbits exposed to 18 hours of light from weaning reached puberty earlier than rabbits housed under a short lighting programme. Hence, increasing daily light exposure from 6 to 18 hours/day may improve litter size in pubertal does. Exposure of rabbits to long days (16HL:8HD) improved the quantity and quality of spermatozoa present in the ejaculates in comparison to those collected in rabbits exposed to short day light (8HL:16HD). Studies approaching photoperiod manipulation in rabbit farms have generally shown a significant improvement in receptivity and fertility of does when the daylight length was artificially increased.

Light for swine :

Long or lengthening day lengths (16 HL or longer) increase food intake in grower/finishers. Short or decreasing day lengths decrease time taken to reach puberty in males and females, and for sows to return to oestrus, these day lengths could therefore be a useful tool in breeding. Lighting programme also affects the lactation behaviours in pigs (Stevenson *et al.*, 1983). The new born piglets significantly feared staying in darkness and trying to move towards bright light area. (Pollard and Littlejohn, 1995). The number of stillborn piglets decreases when pigs are exposed to a 1400 IU vitamin D.24 hours continuous light should be avoided as it increases physiological and behavioral indicators of stress. Cooper *et al.* (1997) reported that daily exposure of pigs for 1-2 minutes to natural UV levels is sufficient for pigs to produce sufficient vitamin production. The impact of photoperiod on feed intake and growth has not been widely researched in the pigs. So there is different thought of the researcher about the photoperiod in swine production.

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