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Scholars Research Library
Annals of Biological Research, 2021, 9 (4): 23-24
(http://scholarsresearchlibrary.com)

ISSN:2278-7356

Factors Affecting Silkworm (*bombyx mori* l.) for the Crop Success and Silk Production

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INTRODUCTION

The science of silk production by breeding the silkworm called sericulture. Silk is known as the queen of textiles because of its lustrous sheen, softness, elegance, durability, and tensile qualities. It was first found in China between 2600 BC and 2700 BC. Silk is a natural fibrous material that comes from the spittle of an insect and is collected from pupal nests or cocoons made by silkworm larvae. Silk is chosen above all other fibres due to its exceptional qualities such as water absorption, heat resistance, dyeing efficiency, and shine. Temperature and humidity are primary factors that affect the physiology of insects. Although there are significant changes in the environment, insects' display a remarkable variety of adaptations to the varying circumstances of the environment and keep their internal temperature and water content acceptable. Adaptation is a complicated and dynamic condition that varies significantly from one species to another. Survival in insects depends on dispersion, habitat selection, habitat alteration, water-related relationships, cold, diapause and developmental rates, environmental sensitivity and cryoprotective chemical synthesis. *Bombyx mori* L. (Mulberry Silkworm) is very fragile, highly sensitive to changes in environment and has been unable to endure extreme natural temperature and humidity swings during five thousand years of domestication. The adaptation of the silkworm to environmental circumstances differs greatly from that of wild silkworms and other insects. In the combination of variables and stages impacting the growth, development, productivity and quality of silk, temperature, humidity, air circulation, gas, light and so on exhibit considerable interaction in influence in the physiology of silkworms.

The effect of temperature on silkworm growth

In the development of silkworms, temperature plays a key effect. As cold-blooded creatures are silkworms, their temperature will have a direct impact on several physiological processes. In general, the early-instar larvae are high temperature resistant, which also contributes to improved survival and cocoon characteristics. Temperature is directly related to soyworms' growth; large temperature fluctuations are detrimental to the development of soyworms. Temperature rise enhances different physiological processes while physiological activity reduces as a result of a drop in temperature. Increased temperature, especially in late instars, increases larval development and reduces the larval stage. At low temperatures, on the other hand, the growth is sluggish and the larval stage extends. The optimal temperature is from 20°C to 28°C for normal soyworm growth, while the ideal temperature is between 23°C and 28°C for maximum production. Temperature above 30°C directly impacts your worm's health. All psychological activity is delayed, especially at early instars when the temperature is below 20°C; as a consequence, worms are too weak and prone to numerous illnesses. Early instars have a high temperature demand (I, II, III) and worms are feeding energetically, increasing aggressively, and leading to a high growth rate. Even in unfavourable settings such strong worms might be more resistant in later instars.

The effect of heat shock protein

Bombyx mori (Pure Mysore, C. Nichi, and Nistari) tropical Indian multivoltin races are more tolerable to high temperatures as opposed to exotic bivoltin racial temperatures. In contrast to multivoltine, bivoltin races have a greater yield potential, producing superior silk quality, but do not live under India's severe climactic conditions. It is known that when treated to high temperatures the cells show a heat shock reaction through a synthesis of a new protein known as Heat Shock Protein (HSP). Many quantitative characteristics are decreasing quickly at higher temperatures, therefore the requirement for thermotolerant bivoltine strains might be one of the main concerns in creating bivoltine hybrids for tropics. The latest improvements in the breeding of silkworms and in the production of stress-induced protein bring up new ways to develop strong productive wedge hybrids.

Role of moisture in silkworm growth

In silkworm rising, humidity plays a key role and its role is both direct and indirect. The combined temperature and humidity effects primarily decide that soyworm development and the formation of quality cocoons are adequate. The physiological activities of the softworm are immediately influenced. The silkworms of the younger years can survive high moisture conditions as the older ones and the growth of worms is strong in this situation. Moisture also has an indirect effect on the withers rate of the leaves in the sheaths of the silkworms. Under dry conditions, the leaves wither extremely quickly, and their consumption by larvae is decreased in winter and summer. This impairs larval growth and leads to leaf loss in the bed. Late development of young larvae makes them fragile and disease-prone. With humidity up to 90%, they can develop without being substantially impacted when the temperature is kept at a range of 26°C to 28°C. Humidity also changes not just seasonally, but also during the day as well, as temperatures do. The silkworm rearers therefore need to control it for their successful cultivation. In order to improve humidity and avoid dry leaves, wax covered (paraffine) material is used to cover the raising beds while still growing up. Wet foam or paper pads, soaked in water, can also be utilised for the purpose of increasing moisture in the raising beds.

Air and light role in silkworm development

Silkworms also need fresh air, like other creatures do. Carbon dioxide gas is introduced into the raising bed by the breathing of silkworms. By its CO_2 concentration, air freshness may be assessed. While the air CO_2 concentration in the raising room is usually 0.03%-0.04%, carbon monoxide, ammonia, sulphur dioxide are produced in the raising room when farmers are burning carbon at higher temperatures. These gases are harmful to silkworms and so fresh air should be kept at a low level by adequate ventilation. The growth of silkworm is delayed if CO_2 surpasses the concentration of more than 2%.