

Development of greenhouse technology for tropical climate

Atitsa Petchsuk^{1,*}, Suthawan Buchatip¹, Wilairat Supmak¹, Duangruthai Srinun¹
and Doungporn Sirikitikul¹

¹*National Metal and Materials Technology Center, 114 Thailand Science Park,
Pathumthani 12120, Thailand*

**Corresponding author, email: atitsp@mtec.or.th*

ABSTRACT:

In tropical climate where a high level of temperatures is maintained throughout the year and has a significant amount of precipitation, greenhouse is essential for obtaining high productivity and high quality produces, not only to provide a suitable environment for plant growth but also to shield plants from heavy rain, strong wind and insects. Greenhouse technologies generally include structural design, cooling technology and covering materials. There are large varieties of greenhouse designs depending on the local conditions and the availability of the building materials like limber, bamboo or steel. Frame types of greenhouse could be quonset, curved-roof, post-truss, gutter-connected venting, saw-tooth venting, etc. For tropical climate, a special design with a very high ventilation capacity and a combination of nettings have to be taken into consideration. To reduce the inside greenhouse air temperature, three categories of commercial methods have been used: ventilation, evaporation and heat prevention. Despite their effectiveness, these cooling technologies are still limited due to cost of installation and operation. Besides the structural design and cooling technologies, the performance of the greenhouse also depends on the covering materials. The good covering materials should protect the growing plants from UV light that is harmful to plant cell and membrane, reduce NIR transmittance that causes an accumulation of heat inside the greenhouse and allow high light transmittance for visible light, Photosynthetically Active Radiation (PAR), with the wavelength 400 – 700 nm. Moreover, the covering film should possess light diffusion property which produces more uniform light distribution leading to the promotion of plant growth. For tropical climate, the possibilities of the development of the covering materials could be in the direction of blocking NIR, blocking UV, improving of anti-fog, anti-dust and anti-algae, light diffusion film and light conversion film, wavelength selective film, etc. In addition to these, the newly developed covering materials at MTEC will also be discussed.

KEYWORDS:

Greenhouse technology; tropical climate; structural design; cooling technology; covering materials