暑熱環境下の作業に用いる着心地に配慮した冷却フィールドウエアの開発

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Development of Cooling Wear for Work under Hot Environment

by

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ABSTRACT

We investigated cooling suits for use in agricultural greenhouses. Six subjects participated to 30 minutes of simulated farm work in the climate chamber set at 31 degrees Celsius（WBGT）with 4 clothes conditions. The clothes worn by the subjects were shirts only, clothing with fans, two types of vests with cooling materials. ECG, tympanic temperature, body weight loss, subjective sensations of comfort, work intensity, thermal and humidity in clothes were measured during the work. As a result, the followings were obtained.（1）It was found that wearing on the standard clothes and on two types of vests with cooling materials increased the tympanic temperature by about 0.2 degrees in 30 minutes of work, while wearing on the clothing with fans tended to suppress the rise of tympanic temperature.（2）It was found that both the

temperature and the humidity in the clothes were lower in the conditions wearing the clothes with fans than those in the others. (3) From the evaluation results of thermal and humidity sensations it was found that both sensations of warmth and wetness were lower the conditions of wearing on the clothes with fans than those in the others. By controlling the environmental conditions in a climatic chamber, we were able to obtain detailed vital signs such as tympanic temperature, then we construct an experimental system to evaluate the effects of clothing conditions for agricultural work.

要　旨

我々は，農業ハウスでの利用を想定した冷却服の開発に取り組んでいる．本研究では，人工気候室内にWBGTが31℃の暑熱環境下を再現し，6名の被験者に4つの着衣条件で30分間の模擬的な農作業を行わせ，冷却服が衣服内気候や体温等の生体信号，作業負担などの主観評価に及ぼす影響を検討した．その結果，以下の結論を得た．(1) 鼓膜温は，標準的な着衣，保冷剤を用いた冷却服では30分の作業で0.2℃程度上昇したが，ファン付き作業服ではほとんど上昇がみられず，体温上昇を抑える傾向があることがわかった．(2) ファン付き作業服では，他の着衣よりも衣服内温度，衣服内湿度ともに低く抑えられることがわかった．(3)「温冷感」,「湿潤感」の評価結果より，ファン付き作業服は他の着衣に比べ暑さ感，湿潤感ともに低いと評価されることがわかった．人工気候室で環境条件を詳細に制御することで，鼓膜温等の詳細なバイタルサインが得られ，衣服条件の違いが農作業の負担に及ぼす影響を評価する実験系が構築できた．