

تقييم نظام تبريد تبخيري للصوب الزراعية تحت ظروف حالة التشغيل المستقرة

رسالة مقدمة من

كمالات محمود مرسى محمود

بكالوريوس في العلوم الزراعية (هندسة زراعية) - كلية الزراعة - جامعة القاهرة، ٢٠٠٢

للحصول على

درجة الماجستير

في

العلوم الزراعية
(هندسة زراعية)

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جامعة القاهرة
مصر

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اسم الطالب: كمالات محمود مرسى محمود. عنوان الرسالة: تقييم نظام تبريد تبخيري للصوب الزراعية تحت ظروف حالة التشغيل المستقرة المشرفون: أ.د. محمد هاشم حاتم. د. خالد محمد عبدا لبارى. قسم: الهندسة الزراعية. فرع: المباني الزراعية والتحكم البيئي.	الدرجة: الماجستير تاريخ منح الدرجة: / / المستخلص العربي يهدف هذا البحث إلى دراسة كفاءة نظام التبريد التبخيري داخل الصوب الزراعية تحت ظروف التشغيل المستقرة. حيث تم قياس درجات الحرارة والرطوبة النسبية داخل صوب مختلفة جميعها مبردة بنظام التبريد التبخيري ذو المروحة والوسادة. وتم تسجيل درجات الحرارة الجافة والرطوبة في ثلاثة نقاط في جميع الصوب (أمام الوسادة، وسط الصوبة، أمام المروحة) من الساعة التاسعة صباحاً وحتى الساعة الخامسة مساءً داخل وخارج كل صوبة وقد تم حساب الرطوبة النسبية وكفاءة التبريد التبخيري. تراوحت درجات الحرارة الجافة ما بين ٢٥ - ٢٦.٥ م° أمام الوسادة وبين ٢٥ - ٢٨ م° في الوسط وبين ٢٦-٢٧ م° داخل الصوبة المبردة (التجربة الثانية). أظهرت النتائج تجانس درجات الحرارة والرطوبة داخل الصوبة الفيرجلاس المبردة بجميع نقاط القياس. كما تم حساب درجات الحرارة الداخلية باستخدام معادلة مُشتقة من نموذج رياضي مبسط وقد تم مقارنتها بدرجات الحرارة المُقاسة داخل الصوبة الزراعية وقد أظهرت النتائج تطابق ما بين درجات الحرارة المقاسة والنتيجة من النموذج الرياضي مع وجود معدل خطأ متوسطه حوالي $\pm 2.7\%$. كما تم حساب ومقارنة قيمة الحرارة المحسوسة داخل الصوبة في كلا من نصفها النصف الأول (من الوسادة إلى المنتصف) والنصف الثاني (من المنتصف إلى المروحة) وقد أظهرت نتائج المقارنة زيادة قيمة الحرارة المحسوسة في النصف الثاني والذي نتج عن زيادة درجات الحرارة كلما ابتعدنا عن الوسادة نتيجة انخفاض الرطوبة النسبية وانخفاض تأثير نظام التبريد التبخيري. الكلمات الدالة: صوب زراعية – نظام التبريد بالوسادة – تبريد تبخيري – كفاءة التبريد – درجة حرارة متنبأة – سرعة هواء – كثافة الضوء.
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EVALUATION OF GREENHOUSES PAD - COOLING SYSTEM UNDER STEADY-STATE CONDITIONS

By

Kamat Mahmoud Moursy Mahmoud

**B.Sc. Agric. Sci. (Agricultural Engineering), Fac. Agric., Cairo Univ.,
Egypt, 2002**

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ABSTRACT

This research work aims to investigate the steady-state heat and mass balance for greenhouses that use pad-fan cooling system. It also studied the evaporative cooling system efficiency in different greenhouses. Dry-bulb and wet-bulb temperatures were measured. Relative humidity and cooling efficiency were calculated and the prediction of dry-bulb temperature and relative humidity inside the greenhouse throughout the proposed simple model were performed. Dry-bulb temperature and relative humidity were homogeneous altitude along the fiberglass greenhouse under investigation (16 m long, average of fan air velocity was 5.25 m/s and pad-face air velocity was 1.2 m/s). The obtained results showed that, the predicted data of dry-bulb temperature inside the greenhouse were validated well with that measured.

Dry-bulb temperature and air relative humidity distributions were uniform inside the greenhouse due to optimum structure design (gable - even - span, cover material and greenhouse orientation) and air velocity and appropriate pad area.

The average predicted dry-bulb temperature was close to the measured temperature with ± 2.7 % standard error. Also, there was a good agreement between measured and predicted values of air relative humidity with standard error of ± 3.19 %.

Moreover, the sensible heat production inside the greenhouses was calculated and compared for the two half's of them (the first half and the second one). The obtained data showed that the sensible heat production increased in the second half of greenhouse (far away from pad system). This increase was due to the increased in the air stream length and the decreased in cooling effect.

Keywords: *Greenhouses - Pad Cooling System - Evaporative Cooling - Cooling Efficiency - Predicted Dry-bulb Temperature - Air Velocity - Light Intensity.*

DEDICATION

I dedicate this work to whom my heart felt thanks; my parents and brothers for all the support they lovely offered along the period of my post graduate studies.

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