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[Continued on next page]

(54) Title: A METHOD FOR MONITORING ANTHESIS OF AN INFLORESCENCE AND A SYSTEM FOR IMPLEMENTING THE SAME

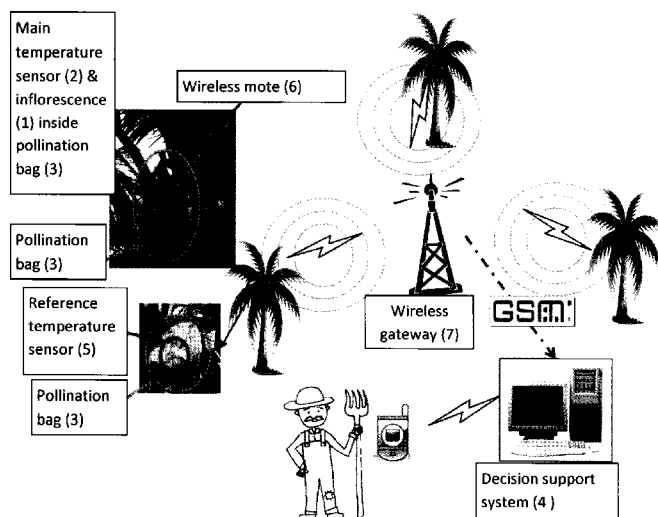


Figure 2

(57) Abstract: The present invention relates to a method for monitoring anthesis of an inflorescence (1). The method comprises detecting the temperature of the inflorescence by having a main temperature sensor (2) installed adjacent to the inflorescence. The monitored temperature is transmitted to a decision support system (4) for determining whether anthesis has occurred. A notification is sent to a user if anthesis is determined to have occurred. The present invention also relates to a system for monitoring anthesis of an inflorescence. The system comprises a main temperature sensor (2) installed adjacent to the inflorescence (1) which has been covered, a transmission means for transmitting data on the temperature detected to a decision support system (4) so that anthesis can be determined.



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- *as to the identity of the inventor (Rule 4.17(i))*
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A METHOD FOR MONITORING ANTHESIS OF AN INFLORESCENCE AND A SYSTEM FOR IMPLEMENTING THE SAME

Field of the invention

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The present invention relates to a method and system for monitoring anthesis of an oil palm inflorescence and more particularly to a method and system for determining anthesis of the inflorescence and notifying a user upon detection of anthesis so that pollination towards the inflorescence can be carried out.

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Background of the invention

Controlled pollination consists of transferring pollen from one plant to the receptive female reproductive organs of another plant while excluding all other pollen. Controlled pollination plays an important role in the commercial crops production, especially in oil palm production, as it facilitates producing progeny with favorable genetic trait inherited from the parent plants. Controlled pollination also contributes to offspring generation with more genetic uniformity compared to the naturally pollinated plants. The success of the pollination process depends greatly on the ability to determine the period at which the flower or floral organs is receptive towards the pollens, namely the anthesis period. The introduction of pollens out of the anthesis period, either too early or too late, will result in the abortion of the unfertilized flowers or the development of parthenocarpic fruits and thus resulted in a poorly pollinated bunch. Thus, the anthesis stage must be accurately determined for the pollination process to take place.

More particularly, in palm trees bearing inflorescences which will develop into fruit bunches upon fertilization, specific procedure is adopted in the controlled pollination system. Prior to the anticipated anthesis occurrence, the inflorescence is required to be covered with a tight bag fitted with a transparent window, so that unwanted pollens will not reach the inflorescence during the

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receptive period of the inflorescence. The transparent window is necessary to enable visual inspection on color and structural developments of the inflorescence, according to the conventional way of detecting anthesis. Upon visual detection of anthesis, controlled pollination is carried out by applying
5 pollens of a desired progeny directly onto the female inflorescence using a hand puffer. Santos et al (1996) reported that the inflorescence should be inspected daily or every alternate day, starting from the day of bagging, to verify the onset of anthesis of the inflorescence.

10 However, since the receptive period lasts for only one to three days, the inaccuracy in determining anthesis and performing pollination even by one day early or late would cause the inflorescence not being pollinated and subsequently leading to bunch abortion. As the process depends on human inspection, inaccuracy in determining anthesis is inevitable and has caused
15 considerable loss of productivity of the commercial crops.

To merely automate the manual process, an image sensor or a camera is required to visually observe the female inflorescence and anthesis is determined based on certain criteria. This way however, brings along a whole set of new
20 problems and requirements such as calibration of the cameras, the need for heavy image processing power and algorithms and so on. Besides, the system becomes too expensive which makes it unviable at the present time.

Bernal and Ervik (1996) disclosed a study on the inflorescence of the palm
25 *Phytelephas seemannii*. In the study, the temperature of the inflorescences was measured before, during, and after anthesis. The method however depends on manual measurement on the temperature of the inflorescences on a timely basis. The method is laborious and therefore not suitable to be incorporated as a practice for commercial plantation or agricultural production.

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Therefore, there is a need to provide a method and system for detecting the anthesis period of an inflorescence in a precise and autonomous manner and

the user will be notified accordingly to perform pollination. In this way, the user is not required to observe the inflorescence of each plant on a daily basis and productivity loss due to negligence in detecting the anthesis of inflorescence can be minimized.

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Summary of the invention

It is an objective of the present invention to provide a method and system for automatically detecting anthesis period of an oil palm inflorescence and notifying the user on the occurrence of anthesis so that controlled pollination can be carried out.

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It is also an objective of the present invention to provide a method and system for detecting the temperature of an oil palm inflorescence and based on the temperature profile, analyzing and determining anthesis of the inflorescence.

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It is yet another objective of the present invention to provide a method for performing controlled pollination upon notification on the occurrence of anthesis sent by a decision supporting system.

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The present invention relates to a method for monitoring anthesis of an inflorescence, comprising installing at least a main temperature sensor adjacent to the inflorescence, covering said inflorescence, detecting temperature of the inflorescence by the main temperature sensor, transmitting data on the detected temperature to a decision support system, determining by the decision support system on whether anthesis has occurred, and sending an alert notification to a user by said decision support system when anthesis is determined to have occurred.

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The present invention also relates to a system for monitoring anthesis of an inflorescence, comprising at least a main temperature sensor installed adjacent to said inflorescence; an enclosing means covering the inflorescence; a decision

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support system for receiving data on the temperature as detected by the main temperature sensor and determining whether anthesis has occurred; and a transmission means for transmitting data on the temperature as detected by the main temperature sensor.

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The present invention relates to a method and system of analyzing the temperature of the female inflorescence with a reference temperature on a regular basis. Once the temperature of the female inflorescence subtracted from the reference temperature reaches a certain value, then the user will be notified
10 by the decision supporting system to carry out the pollination process.

In an alternative embodiment, the present invention monitors the temperature of the female inflorescence without reference temperature and notifies the user once the temperature rises above a predetermined threshold value which is
15 deemed a sign of anthesis so that pollination can be carried out.

Brief description of drawings

Figure 1 is a flow diagram showing the method for carrying out a controlled
20 pollination process utilizing anthesis monitoring system according to the present invention.

Figure 2 is an overview showing the system for monitoring anthesis of an inflorescence according to the present invention.

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Figure 3 is a chart showing the temperature profile of a typical oil palm female inflorescence after bagging process.

Detailed description of the preferred embodiments

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The present invention will now be described in more detail with reference to the accompanying drawings, in which preferred embodiments of the invention are

shown. This invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

The present invention relates to a method for monitoring anthesis of an inflorescence (1) so that pollination can be carried out accurately on time. The method generally comprises installing a main temperature sensor (2) adjacent to the inflorescence (1), covering the inflorescence and detecting the temperature by the main temperature sensor (2). The temperature as detected is transmitted to a decision support system (4) for analysis to determine whether anthesis has occurred based on the transmitted data. If anthesis is determined to have occurred, a notification will be sent to the user so that controlled pollination can be carried out.

Figure 1 shows the general steps for carrying out controlled pollination, in which only the desired pollens are transferred to the female inflorescences. Prior to the monitoring of the temperature of the inflorescence (1), the inflorescence (1) which is anticipated to undergo anthesis is identified.

The female inflorescence is then covered with an enclosing means such as a bag (3), preferably at approximately 7 days before anticipated anthesis, so that unwanted pollen will not be viable to reach the inflorescence when anthesis occurs. It should be understood that, as the main temperature sensor (2) is preferred to be placed within the bag (3), the main temperature sensor (2) has to be installed before the inflorescence (1) is covered with the bag (3).

The main temperature sensor (2) is installed adjacent to the female inflorescence (1) followed by covering the female inflorescence with the enclosing means. The main temperature sensor (2) can be placed anywhere within the bag (3). In a preferred embodiment, the main temperature sensor (2)

is attached to the interior surface of the bag (3). In another embodiment, the main temperature sensor (2) may be attached directly on the female inflorescence (1).

5 The reference temperature sensor (5) is installed in a substantially same environment with the main temperature sensor (2) but without the inflorescence (1). The function of the reference temperature sensor (5) is to detect the temperature of the environment. As such, the reference temperature sensor (5) can be installed inside another enclosing means such as a bag (3) without the
10 inflorescence (1) therein. Preferably, the reference temperature sensor (5) is installed on the same oil palm with the main temperature sensor (2) so that the environmental parameters are similar, if not identical, to that of the main temperature sensor (2). Alternatively, the reference temperature sensor (5) can also be installed without any enclosing means.

15

The detection of temperature by the main temperature sensor (2) and the reference temperature sensor (5) is initiated after a predetermined number of days after the inflorescence is covered. The detection of temperature may be initiated when closer to the anticipated anthesis period to save energy. Once the
20 monitoring system is activated, the temperature is detected and taken by the main temperature sensor (2) and preferably also by the reference temperature sensor (5) for a predetermined number of times in a day, at certain preset point of time.

25 A temperature surge on the inflorescence is the criteria signifying the onset of anthesis, as it was found that there is a strong correlation between anthesis occurrence and the temperature. It can be seen in Figure 3 that the temperature of the inflorescence started to rise at day 8 after bagging and reached its peak at day 9 and 10 which is the anthesis period as confirmed by visual inspection.
30 The data on the temperature as detected by the main temperature sensor (2) and the reference temperature sensor (5) is transmitted to the decision support system (4). The data on the temperature is then analyzed and anthesis is

determined by the decision support system (4). In the embodiment where the reference temperature is not taken, anthesis is determined to have occurred when the temperature as detected by the main temperature sensor (2) reaches a predetermined temperature. In the alternative embodiment where the
5 reference temperature sensor (5) is also in use, anthesis is determined to have occurred when the difference between the temperature as detected by the main temperature sensor (2) and the temperature as detected by the reference temperature sensor (5) reaches a predetermined value. In a preferred embodiment, the predetermined value falls within the range of 0.5 to 20°C.

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If anthesis occurs earlier than the anticipated date, then there is a risk that some unwanted male pollens possibly trapped in the bag (3) might be viable at the time of anthesis. In such situation, the bunch will be aborted to ensure that the produced progeny are of desired hybrid.

15

A notification is sent to the user once the anthesis is determined to have occurred by the decision support system (4). The notification may be embodied in a variety of forms, including but not limited to a message, an alarming sound, an email, or any combination thereof. The notification may be sent to a
20 communication device which is belonged to the user, the communication device including but not limited to a mobile phone, tablet, computer, and laptop.

The method then proceeds to performing the pollination by the user. The bag (3) covering the inflorescence (1) is opened and the pollens of the desired progeny
25 are transferred to the inflorescence (1). This can be carried out, for example, by applying the pollens onto the inflorescence (1) by using a hand puffer. In a preferred embodiment, the pollination has to be performed on the same day or the subsequent day of the receipt of the notification.

30 The present invention also relates to a system for monitoring anthesis of an inflorescence (1). The system of the present invention comprises generally at least a main temperature sensor (2) installed adjacent to the inflorescence (1),

an enclosing means covering the inflorescence (1), and a decision support system (4) for receiving data on the temperature as detected by the main temperature sensor (2) and determining whether anthesis has occurred. A transmission means transmits data on the temperature as detected by the main temperature sensor (2).

With reference to Figure 2, the main temperature sensor (2) is installed adjacent to the inflorescence (1) for detecting the temperature of the inflorescence (1) which is covered with an enclosing means such as a bag (3). The main temperature sensor (2) may be installed at any place within the bag (3), preferably attached to the interior surface of the bag (3). In a preferred embodiment, the bag (3) has an opening which can be sealed to prevent the entry of any air-borne pollen. Besides that, the enclosing means can also be opaque, transparent, or partially transparent.

In a preferred embodiment, the system for monitoring anthesis further comprises at least a reference temperature sensor (5) provided at the same environment with the main temperature sensor (2). The reference temperature sensor (5) may be installed without any enclosing means or preferably, the reference temperature sensor (5) is installed within another enclosing means without inflorescence therein. The main temperature sensor (2) and the reference temperature sensors (5) that may be used are not limited to any specific type or nature, including sensors which are manual, analog, digital, with display, without display, wired or wireless.

The decision support system (4) is in communication with the main temperature sensor (2) and the reference temperature sensor (5) for receiving data on the temperature as detected by the respective temperature sensors and determination of anthesis based on the received data. The decision support system (4) comprises a process and a computer readable storage. The decision support system (4) preferably further comprises computer readable data

configuration, a computer readable monitoring analyzer, and a computer readable tracking and alert mechanism.

The transmission means transmits data from the main temperature sensor (2) and the reference temperature sensor (5) to the decision support system (4). The transmission means may be any wired or wireless communication channels. In a preferred embodiment, the transmission means is a wireless transmission means which comprises wireless motes (6) for transmitting data from the main temperature sensor (2) and the reference temperature sensor (5) to the decision support system (4) over a network via a wireless gateway (7).

In a preferred embodiment of the present invention, the present invention comprises a plurality of the main temperature sensors (2) installed adjacent to the inflorescences and transmit data on the temperature detected to the decision support system (4) for detecting temperature of a plurality of inflorescences (1) concurrently.

Example

We describe below an example of the present invention which is used for monitoring anthesis of an oil palm. Prior to covering the oil palm female inflorescence (1) with the bag (3), the female inflorescences (1) which are going to be pollinated are identified. The female inflorescences (1) which are anticipated to undergo anthesis within seven days are covered with a bag (3) attached with a main temperature sensor (2) on the interior surface of the bag (3). A reference temperature sensor (5) is installed inside a bag similar to the bag covering the main temperature sensor (2). The bag containing the reference temperature sensor (5) is placed in a position similar to the bag containing the main temperature sensor (2) in terms of the height, the number and the height of the surrounding trees, and the orientation relative to the sun.

The temperature is taken by the main temperature sensor (2) and the reference temperature sensor (5) at certain times of the day. Each reading of the temperature detected will be compiled into data in a matrix form, wherein the temperature readings will be arranged in one row in the matrix. For each day, a new row is added to the temperature matrixes of the main temperature $[T_m]$ and the reference temperature $[T_r]$. The temperature profiles are compared regularly to determine whether anthesis has occurred. A general formula for determining anthesis is shown below, where anthesis is deemed to have occurred when:

$$[\alpha] \cdot [T_m] - [\beta] \cdot [T_r] > [T_R]$$

In which $[\alpha]$ and $[\beta]$ are the coefficient matrixes and $[T_R]$ is the triggering matrix. The meaning of the above equation is that if a predefined combination of the temperature of the main bag is greater than a predefined combination of the temperature of the reference bag by the triggering value, then anthesis is deemed to have occurred.

Once anthesis is determined to have occurred, the system will notify the user regarding the event by sending a message to the user's mobile phone. Upon receiving the notification, the user will introduce the male pollen to the female inflorescence on the same day of receipt of the notification to complete the controlled pollination process.

Although the present invention has been described in a specific embodiment as in the above description, it is understood that the above description does not limit the invention to the above given details. It will be apparent to those skilled in the art that various changes and modification may be made therein without departing from the principle of the invention or from the scope of the appended claims.

Claims

1. A method for monitoring anthesis of an inflorescence (1), comprising:
 - installing at least a main temperature sensor (2) adjacent to the
5 inflorescence (1);
 - installing at least a reference temperature sensor (5) in a substantially
same environment as the main temperature sensor (2), without the
inflorescence (1);
 - covering the inflorescence (1) with the main temperature sensor (2),
10 and the reference temperature sensor (5);
 - detecting temperature of the inflorescence (1) by the main
temperature sensor (2);
 - detecting temperature of the environment by the reference
temperature sensor (5);
 - 15 transmitting data on the detected temperature to a decision support
system (4);
 - determining by the decision support system (4) on whether anthesis
has occurred based on the data on the detected temperature; and
 - 20 sending a notification to a user by the decision support system (4)
when anthesis is determined to have occurred.
2. A method for monitoring anthesis of an inflorescence (1) according to
claim 1, wherein anthesis is determined to have occurred when the
25 temperature as detected by the main temperature sensor (2) reaches a
predetermined temperature.
3. A method for monitoring anthesis of an inflorescence (1) according to
claim 1, wherein anthesis is determined to have occurred when the
30 difference between the temperature as detected by the main temperature
sensor (2) and the temperature as detected by the reference temperature
sensor (5) reaches a predetermined value.

4. A method for monitoring anthesis of an inflorescence (1) according to claim 3, wherein the predetermined value is within the range from 0.5°C to 20°C.
- 5 5. A method for monitoring anthesis of an inflorescence (1) according to claim 1, wherein the method further comprises performing pollination after the notification has been sent to the user.
- 10 6. A method for monitoring anthesis of an inflorescence (1) according to claim 1, wherein the method is used for monitoring anthesis of the inflorescence (1) of an oil palm.
7. A system for monitoring anthesis of an inflorescence (1), comprising:
at least a main temperature sensor (2) installed adjacent to the
15 inflorescence (1) for detecting temperature of the inflorescence (1);
an enclosing means for covering the inflorescence (1), wherein the main temperature sensor (2) is attached at the interior surface of the enclosing means;
a reference temperature sensor (5) provided in a substantially same
20 environment as the main temperature sensor (2).
a decision support system (4) for receiving data on the temperature as detected by the main temperature sensor (2) and the reference temperature sensor (5), and determining whether anthesis has occurred;
and
25 a transmission means for transmitting data on the temperature as detected by said main temperature sensor (2) and the reference temperature sensor (5) to the decision support system (4).
- 30 8. A system for monitoring anthesis of an inflorescence (1) according to claim 7, wherein the reference temperature sensor (5) is covered with an enclosing means without any inflorescence (1) therein.

9. A system for monitoring anthesis of an inflorescence (1) according to claim 8, wherein the reference temperature sensor (5) is attached to the interior surface of the enclosing means.
- 5 10. A system for monitoring anthesis of an inflorescence (1) according to claim 7, wherein the decision support system (4) comprises at least a processor and a computer readable storage.
- 10 11. A system for monitoring anthesis of an inflorescence (1) according to claim 7, wherein the transmission means comprises at least a wireless mote (6) connected to the main temperature sensor (2) for transmitting data on the temperature as detected to the decision support system (4) via a network provided by a wireless gateway (7).
- 15 12. A system for monitoring anthesis of an inflorescence (1) according to claim 7, wherein the system is used for monitoring anthesis of the inflorescence (1) of an oil palm.
- 20 13. A system for monitoring anthesis according to claim 7, wherein a plurality of main temperature sensors (2) are installed to concurrently detect the temperature of a plurality of the inflorescences (1).

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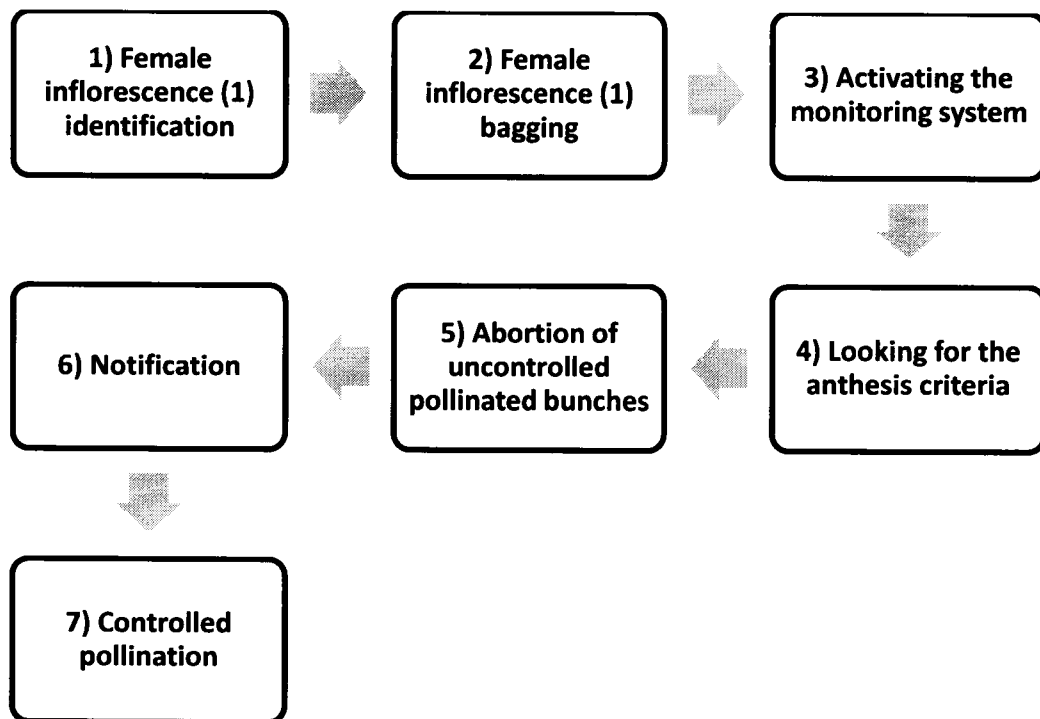


Figure 1

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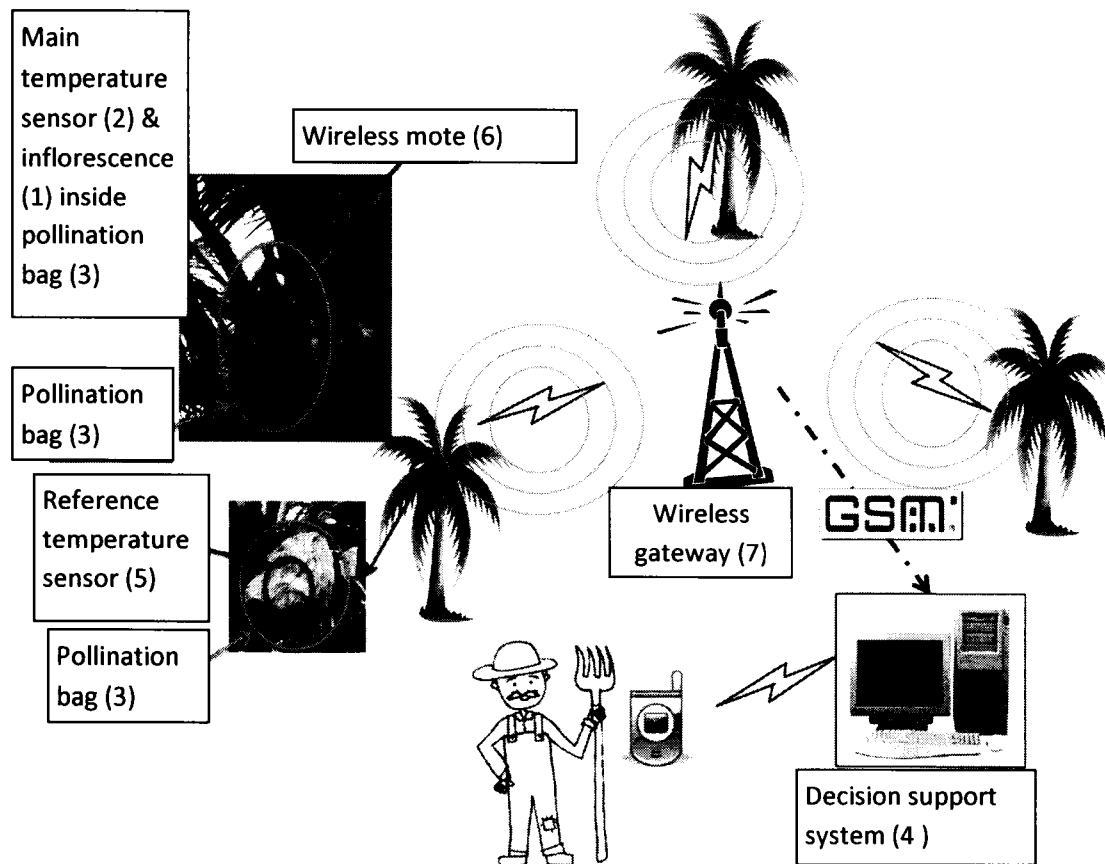


Figure 2

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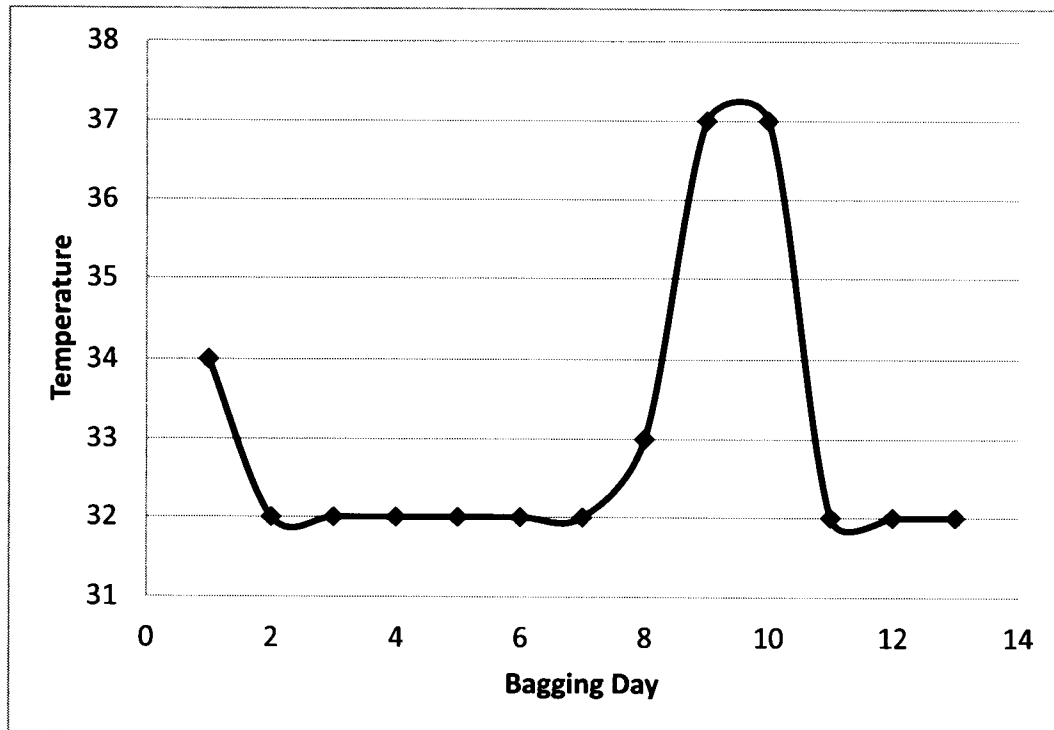


Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2014/000161

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01G1/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A01G G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GERHARD GOTTSBERGER ET AL: "First records of flower biology and pollination in African Annonaceae:,,,and", FLORA, ELSEVIER, NL, vol. 206, no. 5, 24 August 2010 (2010-08-24), pages 498-510, XP028195168, ISSN: 0367-2530, DOI: 10.1016/J.FLORA.2010.08.005 [retrieved on 2011-01-19] page 500, column 1, paragraph 2 - page 500 -----	1-13
Y	WO 2013/095082 A1 (MIMOS BERHAD [MY]; NABIPOOR MOHSEN [MY]; SULAIMAN AZHAR [MY]; BHUYAN M) 27 June 2013 (2013-06-27) page 7, line 11 - page 9; claim 1; figures ----- -/--	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

25 November 2014

Date of mailing of the international search report

02/12/2014

Name and mailing address of the ISA/

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Forjaz, Alexandra

INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2014/000161

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2006/080831 A1 (BADILLO JASSO CESAR SANTOS [MX]) 3 August 2006 (2006-08-03) abstract; figures -----	1-13
A	EP 1 820 391 A1 (CROPDESIGN NV [BE]) 22 August 2007 (2007-08-22) claims; figures -----	1-13
A	WO 2010/019109 A2 (KODALFA BILGI VE ILETISIM TEKN [TR]; ERSAVAS FETHI BULUT [TR]) 18 February 2010 (2010-02-18) page 10 - page 14; figures -----	1-13
A	Rodrigo Bernal ET AL: "Floral Biology and Pollination of the Dioecious Palm Phytelephas seemannii in Colombia: An Adaptation to Staphylinid Beetles", Biotropica, 1 December 2006 (2006-12-01), pages 682-695, XP055154821, Retrieved from the Internet: URL: http://www.medellin.unal.edu.co/~poboyca/documentos/documentos1/polinizacion/POLINIZACION PALMAS/ARTICULOS PARA SEMINARIOS/Floral Biology and Pollination of the Dioecious Palm Phytelephas seemannii in Colombia.pdf [retrieved on 2014-11-25] cited in the application page 685 - page 686 -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/MY2014/000161

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013095082 A1	27-06-2013	NONE	
WO 2006080831 A1	03-08-2006	NONE	
EP 1820391 A1	22-08-2007	AU 2007214616 A1	23-08-2007
		CN 101384164 A	11-03-2009
		EP 1820391 A1	22-08-2007
		EP 1986485 A1	05-11-2008
		JP 4913160 B2	11-04-2012
		JP 2009526536 A	23-07-2009
		US 2009226042 A1	10-09-2009
		US 2014010414 A1	09-01-2014
		WO 2007093444 A1	23-08-2007
WO 2010019109 A2	18-02-2010	US 2010038440 A1	18-02-2010
		US 2011035059 A1	10-02-2011
		US 2013226357 A1	29-08-2013
		WO 2010019109 A2	18-02-2010