

## RELIABILITY OF HEAT SYMPTOMS OF EGYPTIAN BUFFALOES

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### SUMMARY

Data of 85 estrous cases were collected around the year from 5 heifers and 4 non-lactating buffaloes to study the effect of season (cold vs. hot) and status (heifers vs. buffaloes, where buffaloes refer to females which calved at least once) on intensity and reliability of heat symptoms.

Estrus was checked twice daily using a teaser bull to recognize buffaloes on heat based on the appearance of one symptom or more of; standing behavior, bellowing, vaginal mucus discharge, tail raising and nervousness. Heat symptoms were recorded throughout a period extended from 2 days before to 2 days after estrus to determine how long the buffaloes display each heat symptom. Estrus day (true heat case) was determined by ultrasonic technique. According to the number of observed heat symptoms, heat intensity was classified into strong (4-5), moderate (2-3) and weak (one symptom). Estrous detection efficiency and estrous cycle length were also calculated.

The majority of buffaloes (94%) displayed at least two heat symptoms during estrus. Bellowing, tail raising and standing behavior were the displayed in 70-80% of the cases. Symptoms appeared mainly during estrus. Vaginal mucous discharge and nervousness occurred in less frequency during estrus and they appeared one day before and/or one day after its end. The overall mean of estrous cycle length and heat detection efficiency were  $25.1 \pm 1.8$  days and 84 %, respectively.

Efficiency of heat detection was slightly higher in cold season than in hot season (88% vs. 82% for cold and hot season, respectively). Buffaloes had more ability to express their heat symptoms than heifers. However, heat detection efficiency of heifers was better (90 %) than of buffaloes (76 %).

In conclusion, bellowing, tail raising and standing behavior may be considered as the most reliable signs of heat. Detecting estrus two times daily, 12 hours apart, would achieve heat detection efficiency of not less than 80%.

**Keywords:** Buffalo, heat symptoms, heat detection efficiency, reliable symptoms

### INTRODUCTION

Efficiency of heat detection is extremely important for herdsman, where the non-detectable heats have a negative impact on farm practices and profitability (Ahmed *et al.*, 2000). Therefore, studying methods and efficiency of heat detection becomes of high priority from the management point of view.

Buffaloes are reported to have poor estrous behavior relative to cattle. Trials on estrous behavior of Egyptian buffaloes (Hafez, 1954; El-Fouly, 1983; Barkawi *et al.*, 1993 and 1997) emphasized that buffaloes during the hot season tend to show; poor heat symptoms (El-Fouly *et al.*, 1976; El-Fouly, 1983; Khattab *et al.*, 1990 and Barkawi *et al.*, 1993), short heat period (Barkawi *et al.*, 1997) and to display their heat during night (Barkawi *et al.*, 1996 and El-Wardani and El-Aheeri, 2000).

Occurrence of heat symptoms varied among studies. In addition, it may start to appear three days pre and / or post estrus (El-Wardani, 1995). This long period may reduce the accuracy of heat detection and lead to miss proper insemination time.

In small farms, where no teasers or bulls are available, bellowing is the most considerable sign of heat (Aboul-Ela, 1993). At large farms, standing behavior, tail raising, discharge of vaginal mucous, restlessness, bellowing, frequent urination, homosexual behavior and swallowing of vagina were reported as the signs of heat of buffaloes (El-Fouly, 1983 and Barkawi *et al.*, 1993). However, no conclusions were reached as to the determination of which was the most reliable symptoms.

The present work was planned to study the development of heat symptoms around estrus to recognize the more reliable heat symptoms of Egyptian buffaloes, under varying conditions.

## MATERIAL AND METHODS

### *A- Experimental Animals and Management*

Around the year 2001, a total of 85 estrous cases were recorded on 5 heifers and 4 non-lactating buffaloes between 2 and 5 years old with body weight ranging from 300 to 480 kg.

Animals were offered a daily meal averaging 4.5 kg of concentrate mixture, 4 kg of rice straw, and 10 kg of Egyptian clover (*Trifolium alexandrinum*) during the cold season. During the rest of the year, similar ration was offered with replacing the Egyptian clover by Darawa (green maize fodder). Drinking water was offered twice a day at 10:0 hr and 14:0 hr.

### *B- Experimental Procedure*

Animals were classified into heifers and buffaloes (i.e. females which calved at least once), and the year was divided into cold (from November to April) and hot (from May to October) seasons. The study includes the effects of status and season on intensity and reliability of heat symptoms.

Estrus was checked twice daily, for 30 minutes per each round, at 06:30 hr and 18:30 hr, in the presence of a teaser bull to recognize females on heat. According to the previous studies (El-Wardani, 1995 and Barkawi *et al.*, 1997), standing behavior, bellowing, vaginal mucus discharge, tail raising and nervousness were chosen as the more frequent heat symptoms of buffaloes.

Estrous intensity was classified into three groups according to the number of heat symptoms that buffaloes displayed during estrus. Estrus was considered strong when buffaloes showed at least four heat symptoms, moderate when estrus was accompanied with two or three heat symptoms and, weak when only one symptom was observed.



In addition to the day of estrus (zero day), heat symptoms were recorded during two days before, and two days after estrus. Symptoms that appeared in less than 50 % of the cases were considered as occasionally and were eliminated.

Estrous cycles were divided according to their length into three groups, short (<18 days), normal (18-24 days) and long (> 24 days). Estrous detection efficiency was calculated according to Timms' equation (1985) as:

$$\text{Heat Detection Efficiency} = \frac{21 \text{ (average day time of buffaloes' estrous cycle)}}{\text{Average interval between heats}} \times 100$$

Ovulation determination was done using ultrasonic technique (A real-time, B-mode linear array ultrasound scanner, model: Scanner 100 LC, Pie Medical Company, Masstrivht, Netherlands). Both ovaries were scanned daily around the expected estrus. Ovulation was recorded when abrupt disappearance of the largest follicle occurred and replaced by corpus haemorrhagicum (CH) (Plate 1). At that case estrus was considered true.

### C- Statistical Analysis:

Least squares technique was used to examine the fixed effect of status group and season on the length of estrous cycle using linear model of SAS (1998). The interaction between the effect of status and season was tested. No significant effect for the interaction was observed. The linear model underlying each observation was:

$$Y_{ijk} = \mu + a_i + s_j + e_{ijk}$$

Where  $Y_{ijkl}$  = observation

$\mu$  = the general mean, common to all observations

$a_i$  = the effect due to the  $i^{\text{th}}$  status,  $i = 1, 2$  1, heifers 2, cows

$s_j$  = the effect due to the  $j^{\text{th}}$  season,  $j = 1, 2$  1, cold 2, hot

$e_{ijk}$  = a random error associated with individual observations and assumed to be random and normally distributed.

## RESULTS AND DISCUSSION

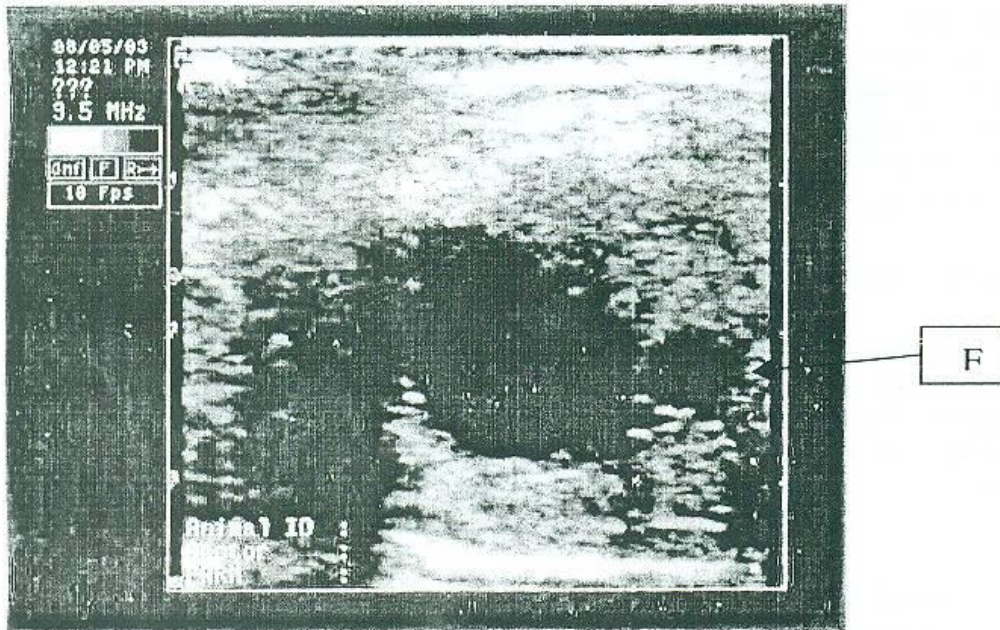
### 1- General features

Quite variation concerning the expression of heat was observed among individuals. In some cases, certain symptom might start to appear one day before estrus and may extend for an extra day(s) after its end. In other cases the same symptom appeared only during the estrus.

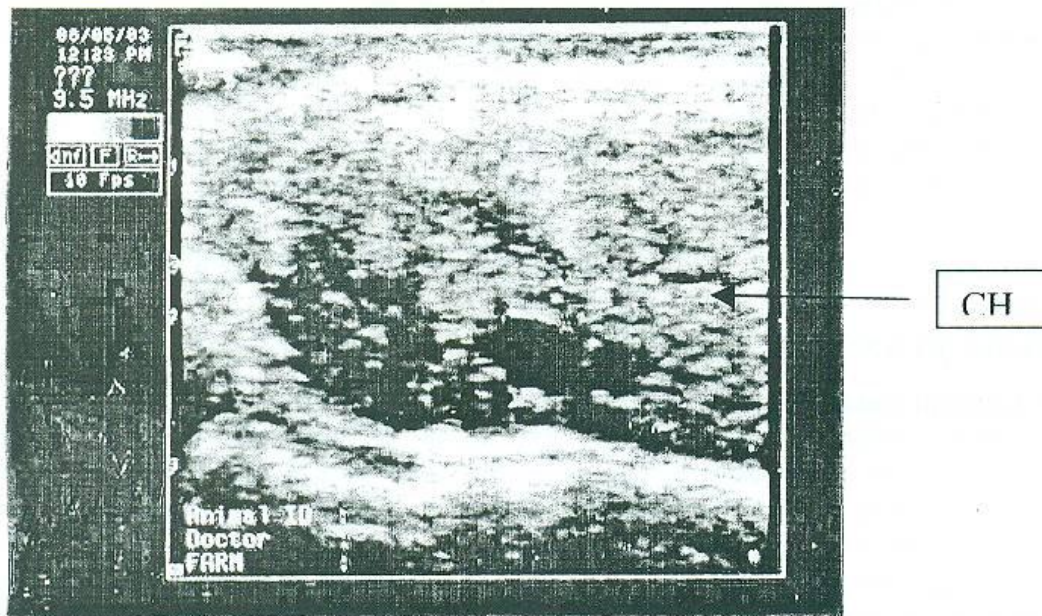
The present results showed that buffaloes expressed their heat in a good manner, where the average heat efficiency was not less than 80%. Moreover, 72 % of the detected cases were strong in intensity, increased to 94 % if moderate cases were considered (Table 1).

Although, nervousness appeared either before heat or after its termination, bellowing, standing behavior, vaginal mucous discharge and tail raising appeared strongly during the heat period. Appearance of these symptoms before and / or after estrus occurred in < 50% of the cases (Table 2 and Figure 1). The interesting point to be noticed is that 20 % of the observed heat cases were not accompanied with standing behavior. The overall mean of estrous cycles length was  $25.1 \pm 1.8$  days. This long average is attributed to the high incidence of abnormal estrous cycles (Table 1).





(1 a ) Image of buffalo's ovary on the day of estrus



(1 b) Image of buffalo's ovary one day post- estrus

Plate I: Image of buffalo ovaries as detected by ultra-sound indicating the follicle (F) before ovulation on the day of estrus (1 a) as black spots and corpus haemorrhagicum (CH) at one day post-estrus (1 b).

Disappearance of follicles as replaced by corpus haemorrhagicum is an evidence for ovulation incidence.



Results indicated that the studied heat symptoms could provide a good base for heat detection practices at farm level, since 94 % of the detected cases were accompanied by at least two signs, which makes heat detection easier and reliable.

These results agree with the findings of Aboul Ela (1993) and Barkawi *et al.* (1993) reporting that bellowing is the more reliable sign of heat at small or medium size herds where teasing practice is not commonly applied and with El-Fouly (1983) Hovious *et al.* (1985) and Barkawi *et al.* (1997), who considered standing behavior as a reliable symptom of heat. Incidence of heat without standing behavior agrees also with the findings of Nemat Ullah and Usmani (1985), Nionsheng and Peichion (1988) and Barkawi *et al.* (1997), who reported that the occurrence of such phenomenon lies between 9-30%.

## 2- Effect of season

Buffaloes had poor heat manifestation during the hot season as compared to the cold one. In the hot weather, three heat symptoms only (standing behavior, bellowing and tail raising) were recorded during estrus in > 50 % of the cases where they were less frequent than that observed during the cold season. The other two symptoms (nervousness and vaginal mucus discharge) occurred in only 30% of the cases. Moreover, all the non-standing estrus cases were observed during the hot season.

Except nervousness which lapsed for long period, the other four symptoms were observed intensively during estrus (0 day) in both seasons (Table 2 & Figure 2).

Estrous cycle length was insignificantly shorter during the cold season than in the hot. However, the percentage of abnormal cycles was higher in the cold than in the hot season. This resulted in better heat detection during the cold season as compared to the hot one (Table 1)

Poor heat symptoms during the hot weather agrees with the findings of El-Fouly *et al.* (1976), Barkawi *et al.* (1993) and El-Wardani, (1995), who indicated the inhibitory effect of the hot season on the heat expression as well as heat detection efficiency. On the other hand, extension of some of the heat symptoms during the cold season for up to two days post-estrus (Table 2 and Figure 2) may be attributed to the long heat period as reported by Barkawi *et al.* (1997).

## 3- Effect of status

Buffaloes had more ability to express their heat symptoms than heifers. Percentage of strong or moderate heat cases of buffaloes was 100 % vs. 90 % for heifers. However, heat detection efficiency of heifers was better than of buffaloes due to their shorter estrous cycle length (Table 1).

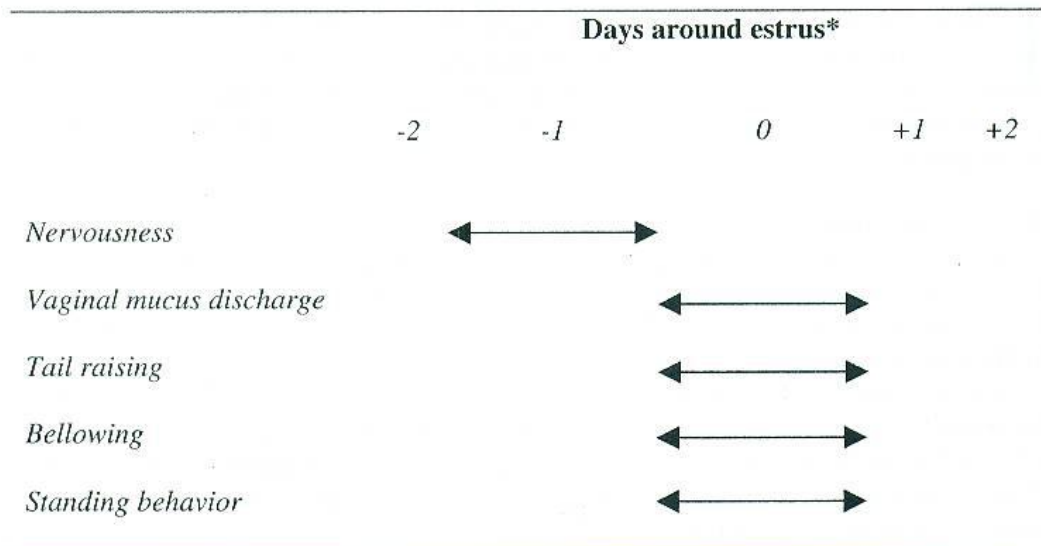
Vaginal mucus discharge was not a regular symptom of heat for buffaloes (< 50 %), while it appeared regularly in heifers (75 %). Nervousness appeared before and after heat in buffaloes, and disappeared completely during heat period in both groups (Table 2 and Figure 3). Estrous cycle length and the percentage of abnormal cycles were less in heifers than in buffaloes (Table 1).

The strong heat symptoms of buffaloes as compared to heifers (Table 1 and 2) is close agreement with the finding of Hafez (1954) who attributed such trend to the experience of buffaloes to display their sexual desire in a better manner than heifers and to the maturation of their endocrine system.

**Table 1. Estrous behavior characteristics and estrous cycle length of Egyptian buffaloes as affected by season and status**

| Trait   | Status    |          | Season   |          | Overall mean |
|---|-----------|----------|----------|----------|--------------|
|   | Buffaloes | Heifers  | Cold     | Hot      |              |
| <b>Heat Intensity (%)</b>   |           |          |          |          |              |
| Strong  | 75        | 70       | 86.7     | 64.3     | 72.1         |
| Moderate  | 25        | 20       | 13.3     | 26.8     | 22.1         |
| Weak  | 0.0       | 10       | 0.0      | 8.9      | 5.8          |
| <b>Frequency of estrous symptoms at day of estrus (%)</b>           |           |          |          |          |              |
| Standing behavior   | 100       | 65.3     | 100      | 69.6     | 80.0         |
| Bellowing   | 75.0      | 71.4     | 79.3     | 69.6     | 72.9         |
| Tail raising  | 83.3      | 77.6     | 93.1     | 73.3     | 80.0         |
| Vaginal mucus discharge   | 16.7      | 73.5     | 51.7     | 48.2     | 50.0         |
| Nervousness   | 38.9      | 38.8     | 51.7     | 32.1     | 38.8         |
| <b>Non standing behavior cases</b>                                  | 0.0       | 34.7     | 0.0      | 30.4     | 20.0         |
| <b>Average estrous cycle length (d)</b>                             | 27.6±1.9  | 23.3±1.8 | 23.9±2.0 | 25.7±1.6 | 25.1±1.8     |
| <b>Distribution of estrous cycles according to their length (%)</b> |           |          |          |          |              |
| Long cycles (> 24 days)   | 36.4      | 13.6     | 35.7     | 16.3     | 26.0         |
| Normal cycles (18-24 days)  | 57.6      | 86.4     | 60.7     | 81.6     | 71.0         |
| Short cycles (< 18 days)  | 6.0       | 0.0      | 3.6      | 2.1      | 3.0          |
| <b>Heat detection efficiency (%)</b>                                | 76.0      | 90.0     | 88.0     | 82.0     | 84.0         |

No. of estrous cases were: buffaloes (36), heifers (49), cold season (29), and hot season (56)



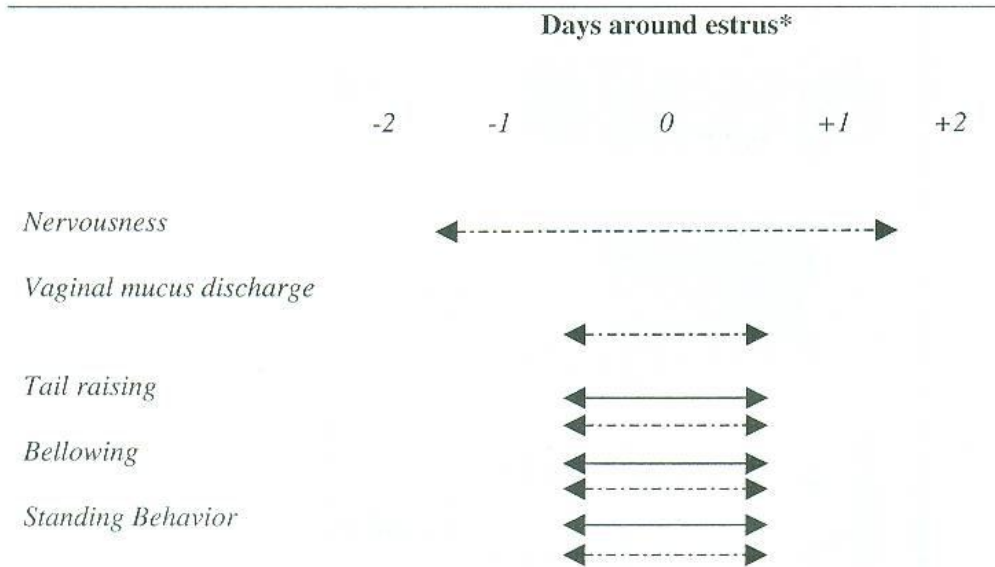
**Figure 1. Development of heat symptoms around estrus.**

\* Heat symptoms that occurred in percentage less than 50 % were considered as occasionally and were dropped from the results.



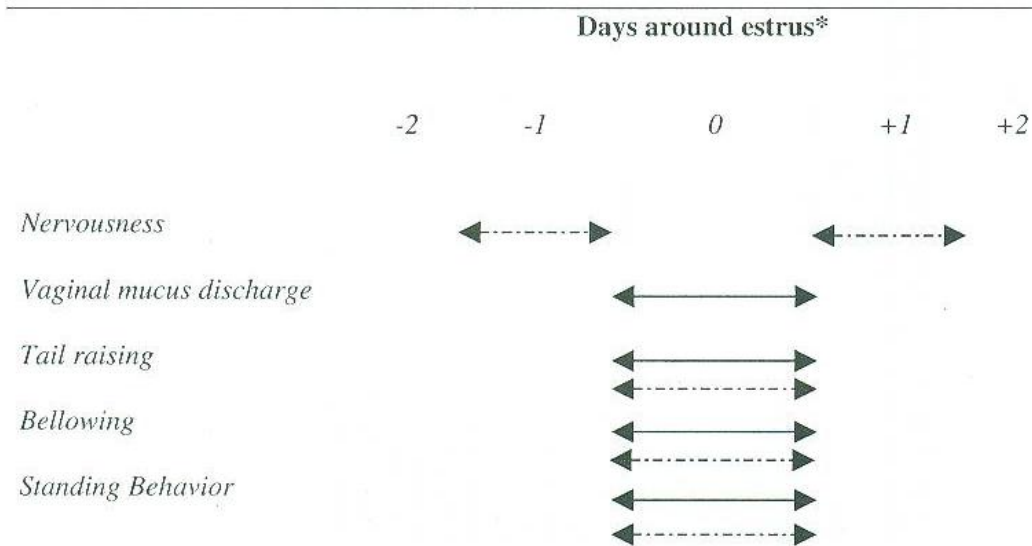
Table 2. Distribution of heat symptoms (%) during two days pre and two days post estrus (0 day) of the Egyptian buffaloes as affected by season of the year (cold vs. hot) and status (heifers vs. cows)

| Trait                   | Days around estrus |     |      |      |         |      |         |      |         |      |         |      |
|-------------------------|--------------------|-----|------|------|---------|------|---------|------|---------|------|---------|------|
|                         | -2                 |     | -1   |      | 0       |      | +1      |      | +2      |      |         |      |
|                         | Cold               | Hot | Cold | Hot  | Cold    | Hot  | Cold    | Hot  | Cold    | Hot  | Cold    | Hot  |
| <b>Effect of season</b> |                    |     |      |      |         |      |         |      |         |      |         |      |
| Standing behavior       | 0.0                | 0.0 | 3.5  | 3.6  | 100     | 69.6 | 37.9    | 17.7 | 6.9     | 0.0  | 6.9     | 0.0  |
| Bellowing               | 0.0                | 0.0 | 24.1 | 12.5 | 79.3    | 69.6 | 24.1    | 44.6 | 6.9     | 3.6  | 6.9     | 3.6  |
| Tail raising            | 0.0                | 0.0 | 6.9  | 1.8  | 93.1    | 73.3 | 34.5    | 25.0 | 3.5     | 0.0  | 3.5     | 0.0  |
| Vaginal mucus discharge | 0.0                | 0.0 | 0.0  | 5.4  | 51.7    | 48.2 | 20.7    | 23.2 | 3.5     | 3.8  | 3.5     | 3.8  |
| Nervousness             | 0.0                | 1.8 | 62.0 | 48.2 | 51.7    | 32.1 | 58.6    | 42.9 | 0.0     | 0.0  | 0.0     | 0.0  |
| <b>Effect of status</b> |                    |     |      |      |         |      |         |      |         |      |         |      |
| Standing behavior       | 0.0                | 0.0 | 0.0  | 8.3  | Heifers | Cows | Heifers | Cows | Heifers | Cows | Heifers | Cows |
| Bellowing               | 0.0                | 0.0 | 18.4 | 13.9 | 65.3    | 100  | 24.5    | 28.0 | 2.0     | 2.8  | 2.0     | 2.8  |
| Tail raising            | 0.0                | 0.0 | 2.0  | 5.6  | 71.4    | 75.0 | 42.9    | 30.6 | 6.1     | 2.8  | 6.1     | 2.8  |
| Mucus discharge         | 0.0                | 0.0 | 0.0  | 0.0  | 77.6    | 83.3 | 30.6    | 25.0 | 0.0     | 2.8  | 0.0     | 2.8  |
| Nervousness             | 2.0                | 0.0 | 36.7 | 75.0 | 73.5    | 16.7 | 38.8    | 0.0  | 4.1     | 2.8  | 4.1     | 2.8  |
| <b>Overall mean</b>     |                    |     |      |      |         |      |         |      |         |      |         |      |
| Standing behavior       | 0.0                | 0.0 | 3.5  | 3.5  | 80.0    | 80.0 | 24.7    | 24.7 | 2.4     | 2.4  | 2.4     | 2.4  |
| Bellowing               | 0.0                | 0.0 | 16.5 | 16.5 | 72.9    | 72.9 | 37.6    | 37.6 | 4.7     | 4.7  | 4.7     | 4.7  |
| Tail raising            | 0.0                | 0.0 | 3.5  | 3.5  | 80.0    | 80.0 | 28.2    | 28.2 | 1.2     | 1.2  | 1.2     | 1.2  |
| Mucus discharge         | 0.0                | 0.0 | 3.5  | 3.5  | 50.0    | 50.0 | 22.4    | 22.4 | 3.5     | 3.5  | 3.5     | 3.5  |
| Nervousness             | 1.2                | 1.2 | 52.9 | 52.9 | 38.8    | 38.8 | 48.2    | 48.2 | 0.0     | 0.0  | 0.0     | 0.0  |



**Figure 2: Development of estrous symptoms around heat period as affected by season of the year (Hot ←→ vs. Cold ←-----→ )**

\* Estrous behavior that occurred in percentage less than 50 % was considered as occasionally and was dropped from the results.



**Figure 3: Development of estrous symptoms around heat period as affected by status (Heifers ←→ vs. Cows ←-----→ )**

\* Estrous behavior that occurred in percentage less than 50 % was considered as occasionally and was dropped from the results.



## GENERAL DISCUSSION

According to the obtained results, the studied five heat symptoms could be categorized into reliable and unreliable, based on the length of period that animals display the symptom and the frequency of occurrence during estrus. Standing behavior, bellowing and tail raising are considered as the more reliable symptoms of heat because they occurred in high frequency during estrus, while their incidence was feeble either pre or post estrus. In addition the appearance of these symptoms were not influenced by season .

Nervousness is considered as unreliable symptom of heat because animals start to display this symptom pre and post estrus. Other factors (e.g. hungry, pain and infection with external parasites) may also stimulate the appearance of such behavior. Although vaginal mucus discharge appeared in 50% of the studied cases during estrus, it also might be considered as unreliable symptom since it is not a common behavior particularly in buffaloes, it was not continuously apparent, and was observed in approximately 25 % during estrus.

In conclusion, bellowing and standing behavior as well as tail raising are considered the most reliable signs of heat of buffaloes and heifers. Detecting estrus two times daily, 12 hours apart is recommended, to achieve heat detection efficiency of > 80%.

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## دقة مظاهر الشبق في الجاموس المصري

آمال كمال العشيري

قسم الإنتاج الحيواني - كلية الزراعة - جامعة القاهرة - الجيزة - ج. م. ع

تم تسجيل بيانات ٨٥ حالة من حالات الشبق للجاموس المصري علي مدار عام كامل (السنة) من خمس عجلات وأربعة جاموسات غير حوامل (والتي ولدت غلي الأقل مرة واحدة) لدراسة تأثير كل من الموسم الجغرافي (البارد والحار) وحالة الحيوان من حيث الولادة السابقة (عجلة- جاموسة) على دقة وقوة علامات الشبق.

تم مراقبة حيوانات التجربة للشبق مرتين يومياً باستخدام ذكر كشاف ، وتم تسجيل خمس مظاهر سلوكية كدليل لحدوث الشبق هي: الثبات للذكر عند محاولة التلقيح ، التنعير ، ظهور الإفرازات المهبلية المميزة للشبق ، رفع الذيل ، السلوك العصبي. تم تسجيل و تحليل مظاهر الشبق خلال فترة خمسة أيام امتدت قبل وبعد الشبق بيومين لتحديد طول فترة ظهور كل مظهر من مظاهر الشبق تحت الدراسة على الحيوانات. كما تم فحص المبايض باستخدام جهاز الموجات فوق الصوتية للتأكد من حدوث التبويض مصاحباً للشبياع. واعتماداً على عدد المظاهر التي ظهرت على الحيوان قسمت الحالات إلى: شبق قوي (عندما ظهرت ٤ أو ٥ مظاهر) ، شبق متوسط (عندما ظهرت ٢-٣ مظاهر) و شبق ضعيف (عندما لم يظهر إلا مظهر واحد فقط). كما تضمنت الدراسة حساب كل من طول دورة الشبق وكفاءة اكتشاف الشبق (كنسبة مئوية).

أوضحت النتائج أن الجاموس بشكل عام (٩٤ %) له القدرة على إظهار مظهرين على الأقل من مظاهر الشبق أثناء الشبياع. وكانت مظاهر التنعير ورفع الذيل والاستسلام للذكر عند محاولة التلقيح هي الأكثر تكراراً (٧٠-٨٠ %) ، كما أنها لم تظهر بوضوح في الفترات قبل أو بعد الشبياع. هذا بينما كانت مظاهر العصبية وظهور الإفرازات المهبلية هي الأقل تكراراً أثناء الشبياع ، كما أنها ظهرت على الحيوانات في فترات ما قبل بداية أو ما بعد نهاية الشبياع. كان المتوسط العام لطول دورة الشبق و كفاءة اكتشاف الشبق  $25.1 \pm 1.8$  و ٨٤ % على التوالي.

كانت قدرة الجاموس على إظهار علامات الشبق وكفاءة اكتشاف الشبق أفضل في الموسم البارد عنه في الموسم الحار (٨٨ % في الموسم البارد مقابل ٨٢ % في الموسم الحار). كما أن الجاموسة لها القدرة على إظهار علامات الشبق بشكل أفضل من العجلة رغم أن كفاءة اكتشاف الشبق أظهرت اتجاهها معاكساً.

ومن الدراسة يمكن استنتاج أن مظاهر التنعير ورفع الذيل والاستسلام للذكر عند محاولة التلقيح هي أكثر مظاهر الشبق للتعبير عن حالات الشبياع في الجاموس المصري ، كما أن مراقبة الشبق بواقع مرتين يومياً وبفاصل زمني ١٢ ساعة يمكن أن يؤدي إلى كفاءة اكتشاف الشبق بنسبه لا تقل عن ٨٠ %.