**Research proposal on browse preference and compatibility for Giraffes in Singapore Zoo**

# **Methodology**

Nine different species of browse will be examined in this study. The browses are listed below:

1. Ficus with long leaves (*Ficus maclellandii*)

2. Ficus with small leaves (*Ficus benjamina*)

3. Acacia, small leave with yellow flowers (*Acacia dealbata*)

4. Starfruit (*Averrhoa carambola*)

5. Nangka (*Artocarpus heterophyllus*)

6. Young cinnamon (*Cinnamomum verum*)

7. Saga (*Adenanthera pavonina*)

8. Miracle (*Moringa oleifera*)

9. Fishtail palm (*Caryota mitis*)

The study will last from May to July 2022. Each species of browse will be offered to the collection of four giraffes housed in Wild Africa exhibit, Singapore Zoo.

We will receive 12 bundles of browse weighing 20kg each per day, of which eight bundles will consist of *Ficus maclellandii* and the remaining four bundles to be assorted browse at random, two types per day. In the event of the giraffe does not want to eat the assorted browse offered, *Ficus maclellandii,* which happens to be their favourite, will still be available to them so that animal welfare is not compromised. Their other dietary requirements such as Johnson’s livestock conditioner pellets, alfalfa hay, carrots and oranges will also be offered to them as per daily routine after the browses are offered.

## ***Data collection***

Ethogram will be recorded three times a day during weekdays. A total of 15 ethograms will collected in a week. However, the collection of data depends on the manpower and on-field tasks. Collection of ethograms would be made in ZooMonitor, where outline of the exhibit is first recorded in the ZooMonitor before data collection.

The weather, temperature and total number of visitors observing the giraffes outside the exhibit will be recorded in the ZooMonitor when every observation is conducted. The type of browse that is hanged at the area is also taken note in the observation. The preference of the browse would be measured through counting the frequency of the bites of the giraffes. A total of 10 minutes would be recorded and hence, the intervals for observation would be every 10 seconds. In 10 minutes, a total of 60 observations will be recorded. For example, one delivered 20 kg bundle will be split into two 10 kg bundles and hung in the designated areas (i.e., Area A – D) within the exhibit (Figure 1).

Species A – Starfruit (*Averrhoa carambola*)

Species B – Saga (*Adenanthera pavonina*)

Species C – Fishtail palm (*Caryota mitis*)

Species D – Acacia (*Acacia dealbata*)

Species E – Nangka (*Artocarpus heterophyllus*)

Table 1: Proposed combination between browse species A to E:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Starfruit (A)** | **Saga (B)** | **Fishtail palm (C)** | **Acacia (D)** | **Nangka (E)** |
| **Starfruit (A)** |  | Starfruit + Saga | Starfruit + Fishtail palm | Starfruit + Acacia | Starfruit + Nangka |
| **Saga (B)** |  |  | Nangka + Fishtail palm | Saga + Acacia | Saga + Nangka |
| **Fishtail palm (C)** |  |  |  | Fishtail palm + Acacia | Fishtail palm + Nangka |
| **Acacia (D)** |  |  |  |  | Acacia + Nangka |

Table 2: Proposed weekly schedule of offered browse combinations, in addition to *Ficus* *spp*.

|  |  |  |
| --- | --- | --- |
| **Week** | **Mon – Fri** | |
| 1 | *Ficus spp* | BC: Saga + Fishtail palm |
| 2 | AD: Starfruit + Acacia |
| 3 | CD: Fishtail + Acacia |
| 4 | AE: Starfruit + Nangka |
| 5 | AB: Starfruit + Saga |
| 6 | BE: Saga + Nangka |
| 7 | BD: Saga + Acacia |
| 8 | AC: Starfruit + Fishtail palm |
| 9 | CE: Fishtail palm + Nangka |
| 10 | DE: Acacia + Nangka |

## ***Statistical analysis***

Principal component analysis (PCA) can be used to interpret the covariance and correlation of the number of frequency of bites of the giraffe and the time taken. The analysis would be performed in the R program.

## ***Dry run***

20kg of the received 12 browse bundles will be split into 24 10kg bundles, totalling up to 16 bundles of *Ficus maclellandii* and eight bundles of two types of assorted browse will be offered to the giraffes. Four bundles of *Ficus maclellandii* and two bundles of two different assorted in the morning during releasing; four bundles of *Ficus maclellandii* and two bundles of two different assortedwill be offered throughout the day in the exhibit after 11.00am; another four bundles of *Ficus maclellandii* and two bundles of two different assortedwill be offered at 4pm; and four bundles of *Ficus maclellandii* in the yard/den overnight when confined.

The placement of browse is shown in Figure 1.

Graphical user interface

Description automatically generated with medium confidenceFigure 1. *Ficus maclellandii* and assorted browse would be placed in Area A to Area D in randomised order.

A total time spent observing would be 10 minutes each for each data recorded in ZooMonitor. The four observations will be recorded at 8.30am, 11.00am, and 4.00pm where browses will be hanged at those timings. The timings are subject to modification and data would only be taken from Monday to Friday. This is due to having more time for the giraffes to consume the browses before the giraffe token feeding with the visitors.

***Faecal scoring system***

Graphical user interface

Description automatically generated

Reference from https://nagonline.net/wp-content/uploads/2018/04/Giraffe-Feacal-chart-2018.pdf

# **Considerations**

Token feeding might be affected due to the new browse introduced. For example, if the giraffes love that particular browse, they might feed on the browse instead of joining the token feeding. With the current workflow, the assorted browses that are offered to the giraffes would be overnight and hence, not be fresh as new browse received at around 11.00am. Try-outs could be done to see if it is feasible.

Based on the previous giraffe browse preference data obtained for the two young giraffe, they only like four types of browse species. With the advice from the experienced keepers, assorted browse should be offered together with the preferred browse, *Ficus maclellandii,* to not compromise giraffe welfare. If the assorted browse were not given together with the giraffe preferred browse, the giraffes will not consume the assorted browse but instead feed on the plants surrounding the exhibit.

Faecal scoring is not particularly encouraged and preferred in this study as the diet for the giraffes are not fixed so there are variables which would need to be taken into account.