



THE EFFECT OF TEMPERATURE ON TERMITES' FORAGING AND FOOD TRANSPORT BEHAVIOR

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Abstract

This article presents the results of a laboratory study on the foraging activity (in quantitative terms) of termites belonging to the genus *Anacanthotermes* at temperatures of 25°C, 20°C, 18°C, and 15°C over a period ranging from 30 to 46 days. The study identifies the optimal temperature for food transport activity.

Keywords: termite, food, temperature, soil, factors, time, activity

Based on the collected data, the impact of different temperatures on the food-transporting activity of termites was studied (Table 1). Temperature directly affects metabolic processes in biological organisms. This is especially true for **ectothermic (cold-blooded)** organisms such as termites, whose energy expenditure, foraging behavior, movement speed, social interactions, and reproductive activity are all directly influenced by environmental temperature. Termites exhibit their highest activity within an optimal temperature range [1]. When the temperature is too low or too high, their movement slows or ceases altogether.

The table below presents data on termite foraging activity (in quantitative terms) at temperatures of **25°C, 20°C, 18°C, and 15°C** over a period ranging from **30 to 46 days**. The variations based on temperature and time show that the **highest level of activity was recorded at 20°C**, suggesting this may be the optimal temperature for termite foraging. Activity was also relatively high at 18°C, though the rate of



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increase slowed during the 42–46 day interval. At 25°C, activity increased gradually, but the maximum value remained lower. At 15°C, activity remained very low throughout the entire period and plateaued at a value of **1.2 on day 38**, with no further change observed afterward, indicating that metabolic processes were significantly suppressed at this temperature. Based on plotted graphs of termite activity relative to temperature, the following conclusions can be drawn:

- **At 20°C and 18°C**, the activity curve rises in a **parabolic** manner and then stabilizes.
- **At 25°C**, a **slowly increasing curve** with **low intensity** is observed.
- **At 15°C**, the curve is almost **horizontal**, indicating very low and unchanging activity.

1- table

The Effect of Soil Temperature on the Foraging Activity of Termites

days	25 degree	20 degree	18 degree	15 degree
30 days	0,3	0,8	1,2	0,2
34 days	1,1	1,7	2,3	0,8
38 days	1,9	3,9	4,1	1,2
42 days	2,6	5,8	5	1,2
46 days	3,1	6,2	5,7	1,2

Based on the studied data, it is evident that termite activity is directly influenced by external temperature. The **optimal temperature range is between 18°C and 20°C**, within which termites exhibited the highest food-transporting activity. In contrast, **very low temperatures (15°C)** created unfavorable conditions for movement, significantly reducing their metabolism and social behavior.

Termite foraging activity is not only strongly affected by temperature but also by the **time factor** [3]. Experimental results indicate that, at each temperature condition, termite activity increased over time. However, this increase did not occur at the same rate — **the rate of activity growth over time varied depending on the temperature** [2].



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The overall dynamics of termite activity over time The following observations indicate that, regardless of temperature, termite activity increased over time:

- **Day 30** – Activity was at a low, initial level across all temperatures.
- **Day 34-38** – Activity entered a sharp increase phase.
- **Day 42-46** – In most cases, activity reached a near-stable state or growth slowed down.

This pattern can be described as a **three-phase growth model**:

4-table

Changes in Termite Activity Over Time

Steps	Description
Phase I (Day 30)	Activity low; adaptation to the new environment phase.
Phase II (Day 34-38)	Adaptation complete; activity sharply increases.
Phase III (Day 42-46)	Activity stabilizes or increases slowly.

Changes Over Time Based on Temperature We will now examine how activity changed over time at each temperature:

1. 20°C:

- Day 30: 0.8 → Day 46: 6.2
- The increase is 7.75 times. This is the highest rate.
- A sharp increase was observed in each interval.
- At this temperature, termite activity increased rapidly and consistently over time.

2. 18°C:

- Day 30: 1.2 → Day 46: 5.7
- The increase is 4.75 times. The growth was rapid until day 42, then slowed down.
- At this temperature, initially high activity was observed, but after day 42, the growth slowed down.

3. 25°C:

- Day 30: 0.3 → Day 46: 3.1



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- The increase is 10 times, but due to the very low initial activity, it is relatively modest.
- Activity increases gradually, but the maximum level is low.

4. 15°C:

- Day 30: 0.2 → Day 38: 1.2 (after which it remains unchanged).
- Activity increases slowly until day 38, then stops.
- The effect of time is present until day 38, after which it may have reached a physiological limit.

Over time, termites enhance their activity through adaptation to the new environment, establishing directions, setting up pheromone communication pathways, and activating social interactions. This is why their activity is low in the initial phase (Day 30).

Especially at 20°C and 18°C, over time, their colony mechanisms (such as food finding, food transport duty, and direction setting) begin to operate rapidly. This leads to the strengthening of task division among the termites. Stabilization phase: Between days 42–46, especially at 15°C and 18°C, a stabilization of activity is observed. This likely indicates either the colony reaching its maximum activity or the environmental conditions becoming limiting factors [4]. Biological limit: When the temperature is low, growth eventually stops over time. This indicates that while time itself increases activity, it only does so within the physiological limits of the organism.

The termites were studied in soils with temperatures of 15°C, 18°C, 21°C, and 25°C. As a result, after 30 days, the amount of food transported by termites was highest in the 18°C soil temperature variant, reaching 1.2 grams, compared to other variants where it was very low, ranging from 0.2 to 0.3 grams in 15-25°C temperatures. During days 34-38, the highest activity was again observed at 18°C. After days 42-46, the amount of food transported was very low at 25°C, with values between 2.6 and 3.1 grams, while the 20°C variant showed the highest activity, reaching 6.2 grams.



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