



EFFECTS OF DAUCUS CAROTA (CARROT) JUICE ON MEMORY AND COGNITO-MOTOR BALANCE AND GAIT PATTERNS IN RATS

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ABSTRACT

The effects of *Daucus carota* (Carrot) juice on memory, cognito-motor balance and gait pattern was investigated in wistar rats. Twenty (20) wistar rats weighing from 120-150g were used for this study. The twenty (20) rats were sorted into four groups with five (5) wistar rats in each group. The first group served as the control group, which was given only feed and water. The second group was administered dopamine (0.1ml/100g), intraperitoneally in addition to their feed and water. The third group was administered low dose of *Daucus carota* juice (0.5ml/100g). The fourth group was administered high dose of *Daucus carota* (Carrot) juice 1ml/100g. Neuro- behavioral tests for memory, cognito-motor balance and gait patterns were carried out using the passive avoidance test, rotarod test, handgrip test and beam walking test. The outcome of this study was statistically analyzed using ANOVA. The results of study showed that *Daucus carota* (Carrot) juice has a significant ($p < 0.05$) memory boosting effect and improved cognito-motor balance but has little or no significant influence on gait patterns.

BACKGROUND OF STUDY

The *Daucus carota* (*Daucus carota subsp. sativus*) is a root vegetable, usually orange in color, though purple, black, red, white, and yellow cultivars exist (Sifferline & Alexandra, 2018). *Daucus carota* are a domesticated form of the wild *Daucus carota*, *Daucus carota*, was native to Europe and southwestern Asia. The plant probably originated in Persia and was originally cultivated for its leaves and seeds. The most commonly eaten part of the plant is the taproot, although the stems and leaves are eaten as well. The domestic *Daucus carota* has been selectively bred for its greatly enlarged, more palatable, less woody-textured taproot. Memory is the faculty of the brain by which data or information is encoded, stored, and retrieved when needed. It is the retention of information over time for the purpose of influencing future action (Lauralee Sherwood, 2015). If past events could not be remembered, it would be impossible for language, relationships, or personal identity to develop (Eysenck & Michael, 2012). Memory loss is usually described as forgetfulness or amnesia (Staniloiu *et al.*, 2012).

Cognitive processes are analyzed from different perspectives within different contexts, notably in the fields of linguistics, anesthesia, neuroscience, psychiatry, psychology, education, philosophy, anthropology,

biology, systemics, logic, and computer science (Von Eckardt & Barbara, 1996). These and other different approaches to the analysis of cognition are synthesised in the developing field of cognitive science, a progressively autonomous academic discipline. Human gait refers to locomotion achieved through the movement of human limbs. Human gait is defined as bipedal, biphasic forward propulsion of center of gravity of the human body, in which there are alternate sinuous movements of different segments of the body with least expenditure of energy. Human gaits are classified in various ways. Every gait can be generally categorized as either natural (one that humans use instinctively) or trained (a non-instinctive gait learned via training). Examples of the latter include hand walking and specialized gaits used in martial arts (Tattersall *et al.*, 2014).

MATERIALS and METHOD

ANIMALS

Twenty (20) Female wistar rats were purchased and kept in cages, the cages were kept at the animal house of the department of Human Physiology, University of Port Harcourt. The rats were kept to acclimatize for two (2) weeks. The rats were kept in cages with enough ventilation and sawdust was used to make beddings for them, they were fed with feed and water in separate containers. The feed and water was given daily and the

beddings was changed upon dampness. The rats were weighed using a weighing balance and recorded as 120-150g, they were separated and grouped into four (4) categories

Group one (1) served as the control group allowed ad libitum water and feed throughout the research.

Group two (2) had Dopamine administration after two weeks of acclimatization prior to running the tests.

Group three (3) served as low dose *Daucus carota* group. 0.5ml/100g *Daucus carota* juice was administered to group three (3) in addition to their feed and water.

Group four (4) served as high dose *Daucus carota* group. 1ml/100g *Daucus carota* juice was administered to group four (4) in addition to their feed and water.

Preparation of *Daucus Carota* Juice

Adequate amount of *Daucus carota* were juiced and it was preserved in a refrigerator for the period of time being used. It was administered to the rats in group three (3) and group four (4), 0.5ml/100g and 1ml/100g respectively. The juice was administered orally using a 1ml syringe. The *Daucus carota* juice was administered to both groups daily for two weeks before experiment and during experiment also. The dopamine was administered to the rats in group two (2) at 0.1ml/100g..

Passive Avoidance Task

It is a useful task for evaluating the effects of novel chemical entities on learning and memory as well as studying the mechanism involved in cognition according to the modified method of King & Glasser, (1970).

Principle:

The testing apparatus is a trough-shaped alloy divided into two distinct compartment with an opening door. The white, brightly lit compartment is free of aversive stimulation whereas the black, dark compartment is equipped with shock capability. It measures the basic ability to learn and remember the presence and place of a shock stimulation. In accordance with the guidelines of the American psychological association, the shock intensity used in this task should be the minimal amount

needed to motivate the animal. However, no aversive stimulus applied to animals upon re-entry into the dark compartment during testing.

Rotarod Test

The rotarod test is a widely used behavioral task used to evaluate the motor coordination of rodents. It assesses the rats' ability to remain on a rod rotating at an accelerating speed. Animals experiencing impaired motor coordination are unable to cope with the rotating rod and will drop off when the rotation speed exceeds their motor coordination capacity according to the modified method of Jones & Roberts, (1968).

Beam Walking Test

Beamwalk assess the fine motor coordination and balance in rodents. The subject is expected to traverse the narrow, elevated beam while staying upright, without falling according to the modified method of Carter & Morton (2001).

Procedure

- The animals were exposed to pre-training to reduce neophobia. The animals were allowed to cross the beam, with gentle guiding or prodding as needed, until they cross readily. This took 3 trials.
- The rats were placed on one end of the beam walk singly and was timed for 5minutes for it to walk over to the other end of the beam walk. The beam walk is 50cm above the ground level with a very narrow surface.

Handgrip Test

The purpose of this test is to measure the maximum isometric strength of the hand and forearm muscles.

Procedure: The animal was held by the tail and neck skin and is allowed to grip the bar or grid. The time it takes to lose its grip on the bar is recorded (modified method of Smith *et al*, 1995).

RESULTS

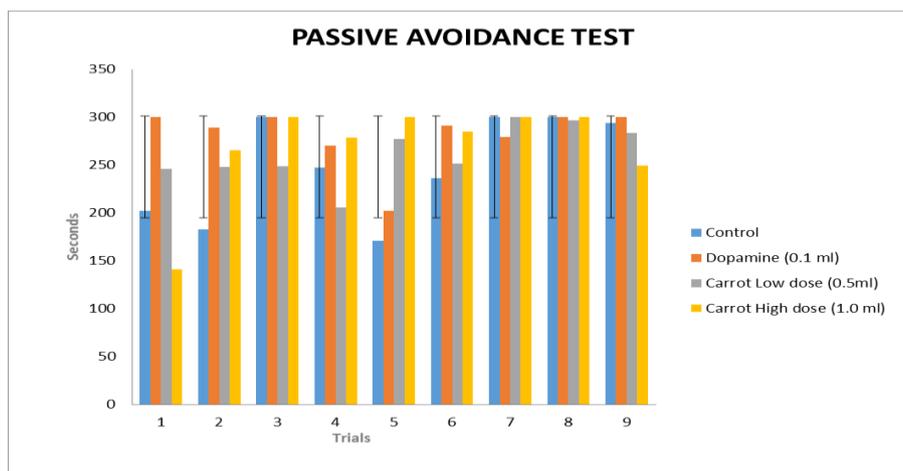


Figure.1: Activities of *Daucus carota* on the cognition of the animals using Passive Avoidance Test.

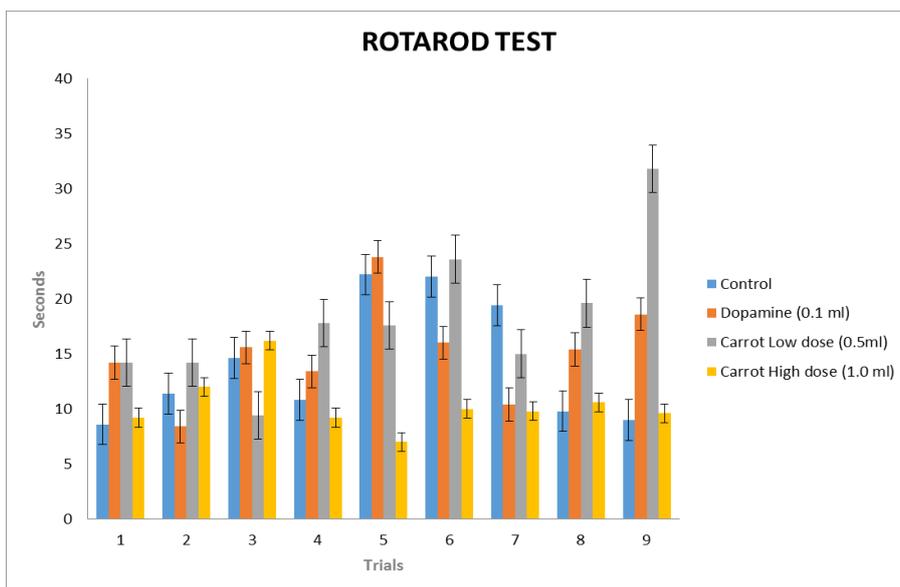


Figure 2: Assessment of *Daucus carota* effect on motor balance using the rotarod test.

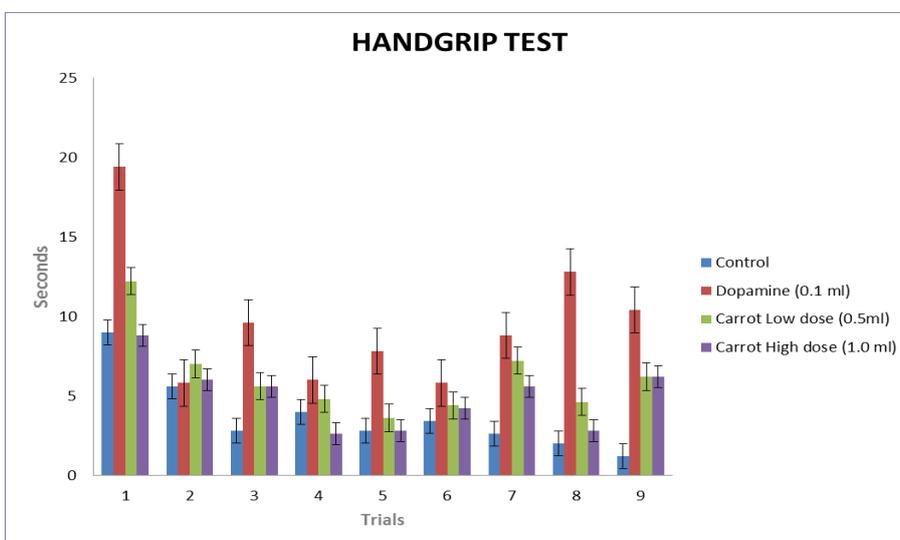


Figure 3: Assessment of paw motor steadiness activity of *Daucus carota* using the Handgrip test.

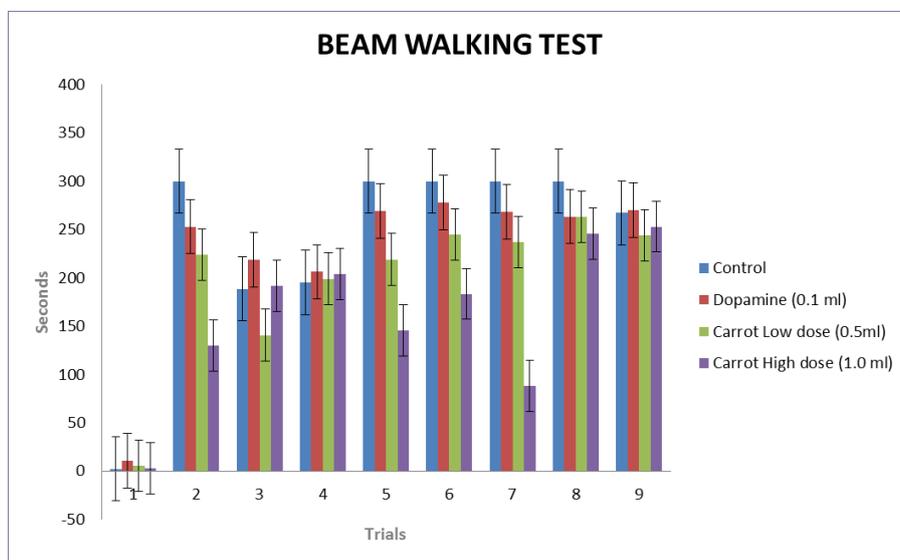


Figure 4: Assessment of *Daucus carota*'s effect on gait pattern in the animal using Beam walking test

DISCUSSION

The effects of *Daucus carota* juice (0.5ml/100g & 1ml/100g) on the cognito-motor balance (Cognition, memory and motor co-ordination) and gait patterns (locomotion) in wistar rats was investigated. The present study revealed the effects of the plant on memory, cognition and anxiety-like behaviors. These effects of *Daucus carota* juice on memory of wistar rats were investigated using the passive avoidance test. Learning and memory function is primarily governed by the hippocampus, which is markedly susceptible to oxidative stress. Accumulating studies have substantiated that oxidative stress can cause learning and memory impairment (Fukui *et al.*, 2002).

From figure 1; After the administration of *Daucus carota* juice (0.5ml/100g and 1.0ml/100g) for a period of two weeks to group 3 and 4, and dopamine (0.1ml/100g) to group 2, the result revealed that the latency of group 4 (*Daucus carota* high dose) to re-enter the dark compartment equipped with shock capability was lower compared to the control group.

The result also showed that rats in group 3 also exhibited a lower latency to re-enter the dark compartment compared to the control group but when compared with rats administered high dose of *Daucus carota*, rats administered high dose showed a lower latency to re-enter the dark compartment equipped with shock capability. This indicated that high dose of *Daucus carota* juice (1ml/100g) increases memory function compared to other test groups. One of the objectives of the present study is to determine possible beneficial effects of *Daucus carota* on cognito-motor balance in rats. And this was significantly demonstrated in the study. (Hamm *et al.*, 1994).

Rotarod test result from Figure 2; after the administration of *Daucus carota* juice(0.5ml/100g and 1.0ml/100g) for a period of two weeks to group 3 and 4, and dopamine(0.1ml/100g) to group 2, showed that the test groups has a longer latency to fall off the rod compared to the control group. Recent evidence has indicated that accelerating rotarod task is a more sensitive index for assessment of motor impairment induced by traumatic brain injury in rats than both beam-walking and beam-balancing task (Southwell *et al.*, 2009). *Daucus carota* juice (high/low dose) showed a better performance on the bar in the rotarod test suggesting the absence of impaired motor function. From Figure 3; After the administration of *Daucus carota* juice low dose(0.5ml/100g) and high dose(1.0ml/100g) for two weeks to group 3 and 4, and dopamine(0.1ml/100g) to group 2. The result showed that the test groups has a longer latency to hold on to the bar/grip compared to the control group. The rats in group 2, dopamine (0.1ml/100g) has a longer latency compared to the groups administered *Daucus carota* (groups 3 and 4).

The rats administered *Daucus Carota* low dose (0.5ml/100g) happened to show a longer latency to hold on to the grip compared to the high dose group (1.0ml/100g) group. This indicated that *Daucus carota* juice has effects on the motor ability and balance of the rats. The reduced ability in the high dose group could have indicate a non-dose dependent fashion of activity. The effects of *Daucus carota* juice on the gait patterns of wistar rats was investigated using the beam walk test. From Figure 4; the result showed that in relation to time, the control group shows a slower movement pattern compared to the test groups although the test groups were extremely very slow. The group administered dopamine (0.1ml/100g) was dizzy and irresponsive thus performing very poorly in walking along the beam. There is an indication that *Daucus carota* juice does not have a significant effect on gait pattern of rats.

CONCLUSION

Daucus carota juice has demonstrated a significant effect on memory and cognition in wistar rats. The juice also had an improving effect on cognito-motor balance but quite doubtful on gait patterns of wistar rats.

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