



Sensing Without a Brain: Functional Parallels Between Plants and Animals Senses

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Abstract

Plants possess a remarkable ability to sense and respond to their environment, despite lacking nervous systems or sensory organs found in animals. This study investigates how plants demonstrate analogues to the five classical senses - sight, smell, hearing, touch and taste - through biochemical pathways and molecular receptors. Mangrove plants such as *Avicennia germinans* exhibit adaptations resembling both respiratory and taste senses, using specialized root structures to detect salinity and filter oxygen. Carnivorous species like *Nepenthes*, *Utricularia* and *Sarracenia* display a form of taste sense, identifying and digesting prey through chemical detection and enzymatic activity. Additional examples include touch-sensitive *Mimosa pudica*, sound - responsive *Arabidopsis* and visually deceptive orchids that mimic insects or birds. Genetic parallels between plant and animal sensory systems, including photoreceptors, mechanoreceptors and signaling proteins, suggest deep evolutionary roots of environmental perception. This work highlights the complexity of plant intelligence and challenges the notion that sensory perception is exclusive to the animal kingdom.

Keywords: *Touch Sense, Smell Sense, Auditory Sense, Vision Sense, Tasty Sense.*

Suggested citation: Ikkurthi, V.K., Mallikarjuna, K., Naik, B.J., Penchala, P.G., Skylab, G., Thanuja, V., & Vinnakota, L. (2026). Sensing Without a Brain: Functional Parallels Between Plants and Animals Senses. *European Journal of Ecology, Biology and Agriculture*, 3(1), 49-60. DOI: 10.59324/ejeba.2026.3(1).05

Introduction

Introduction to Sences plants don't have nervous system like animals do, but plants have *peculiar* mechanisms that allow them to sense and respond to their surroundings. They almost have a set of "plant senses". Here's how plants mimic some senses as animals do (Trewavas, 2005; Chamovitz, 2012).

Any organism interacts with their environment through a complex system of senses that help them perceive and respond to the world around them. Primary senses are categorized into five types: visionary sense, auditory sense, olfactory sense, gustatory sense and tactile sense (Purves *et al.*, 2018). These senses are recognized by specialized sensory organs such as eyes, ears, nose, tongue, and skin. They help in detecting specific types of stimuli and send signals to the brain for interpretation. In addition to these five senses, other senses like balance (vestibular sense), body position (proprioception), pain and temperature are also recognized by the scientists. Together, these senses play a crucial role in survival, communication, and everyday functioning (Labate and Cavnar, 2018).

Sight (Visionary) Organ: Eyes are the organs that detect the Stimulus of light and color through photoreceptor cells in the retina (rods and cones). This stimulus is sent through the optic nerve to the brain which allow us to perceive shapes, movement, color, and depth. Vision is considered as the most dominant human sense in terms of processing the data (Purves *et al.*, 2018; National Eye Institute, 2020).

Hearing (Auditory) Organ: Ears are the organs which help to detect stimuli of sound waves (vibrations). Sound waves are captured by outer ear pinna, which channelize them to ear canal and then to the eardrum, causing it to get vibrate. These vibrations are further transferred through the middle ear bones (ossicles) to the inner ear (cochlea), here they are converted into nerve signals and sent to the brain (Marieb and Hoehn, 2018).

Smell (Olfaction) Organ: Nose is the organ of olfaction. The air that enters nasal cavity detect airborne chemical substances. Olfactory receptors capture chemical molecules in the air are sent directly to the olfactory bulb in the brain, which then processes smells. Smell is closely linked to memory and emotion (Bear *et al.*, 2020).

Taste (Gustation) Organ: Tongue detects the Stimulus of the Chemicals in food and drink. Taste buds which are on the tongue detect five primary tastes namely sweet, sour, salty, bitter and umami (savory). These taste signals are combined with smell and give us the perception of flavor (Chandrashekar *et al.*, 2006).

Touch (Tactile Sense) Organ: Skin is the major sensory organ that detects pressure, vibration, temperature, and pain. Skin consists of variety of nerve endings that detect physical contact, temperature, and damage. The stimulus of touch is transferred to brain and help us to react accordingly. Tactile sense is essential for protecting the body and for physical interaction with the environment (Kandel *et al.*, 2013).

Materials and Methods

My research was done by looking at the plant and tasting it. This was done to understand my research, for example, the shapes of a plant, birds, humans, animals in the forest, the shapes of insects, the different shapes of plants, flowers, fruits, etc. Based on this, it is believed that the taste may also be affected by the acidity or alkalinity levels present in some soils, as well as the taste of salt, which stops the plant from traveling in that direction. Any plant that is exposed to high levels of salt will stop growing and develop outwards by changing its body parts and traveling. For example, the roots of mangrove plants have undergone transformation. Similarly, the expression of taste in plants, Ex: Nepenthes, is understood as the perception of taste in insectivorous plants. Where there is a lot of acid, plants grow in areas where micro-organisms are present. In orchids, the flowers are in the form of a monkeys, Birds, insects and some wild lives. That is, if we look at plants as animals, and understand whether they have a genetic relationship with those plants, then if there is a genetic relationship, those plants should be shown in the



form of not only a monkey but also different types of animals. But that's not what was shown here. What was shown was mostly in the form of some birds, and in the forests, plants are mostly shown in the form of birds that are more related to the fauna. But plants have very little contact with humans.

Just as some plants pass on their habits to subsequent generations, so too have habits been passed on in the sense. For example, in the touch me not plant, the sense is also passed on. Also, the visionary sense and special features of the orchid have been passed down to the next generation. Visionary sense and special features in orchids have also been passed down to later generations.

Detection of Volatile Organic Compounds (VOCs): Plants emit volatile organic compounds (VOCs) such as methyl jasmonate, green leaf volatiles and ethylene. Plants which are in vicinity or even the same plant can detect these VOCs through receptor proteins, that trigger internal responses. The purpose of Plant "Smell" is to Defend itself from herbivores. If a plant is damaged by herbivore, it releases VOCs to signal nearby plants to boost up their own defenses such as producing unpalatable or toxic substances. There is no particular organ for sensing smell in plants as the animals have, but they have similar mechanism for olfaction. The biochemical pathways present in plants respond to specific molecular function which are similar to smell in animals. Example: Tomato plants can detect methyl jasmonate from nearby damaged plants and begin producing defense proteins—even before being touched by pests (Mélanie *et al.*, 2019; Stirling *et al.*, 2024). In pollination some flowers release scents to attract pollinators, this phenomenon can be considered as communication. Plants may "eavesdrop" on stress signals from other plants, preparing themselves for potential threats (Melanie *et al.*, 2019; (Stirling *et al.*, 2024).

Sound or Vibration Sensing (Mechanical Stimuli): Plants lack ears, but they can sense mechanical vibrations (like sound waves or touch), which affects gene expression. Genes involved: Mechanosensitive ion channels (e.g., MSL family in plants, Piezo in animals). Both respond to mechanical signals by activating calcium signaling and gene transcription (Dodd *et al.*, 2005; Harmer, 2009).

Circadian Rhythm Genes: Both plants and animals have clock genes that control their internal 24-hour rhythms. Shared gene families: TOC1, LHY, CCA1 (plants); CLOCK, BMAL1 (animals). Cryptochrome genes play a major role in both (Dodd *et al.*, 2005; Harmer, 2009).

Signal Transduction and Neurotransmitter-like Molecules: Glutamate receptors (GLRs) in plants are homologous to animal glutamate receptors (used in brain synapses). In plants: GLRs help regulate root growth, defense, and wound signaling. In animals: GLRs transmit signals between neurons. Calcium signaling, reactive oxygen species (ROS), and electrical impulses are used in both systems to transmit information (Lam *et al.*, 1998; Price *et al.*, 2012; Mousavi *et al.*, 2013).

Table 1. List of Plant Parts Proposed Sensing Mechanisms

S No.	Scientific name	Family	Common name	Vernacular name	Sense
1	<i>Mimosa pudica</i> L.	Fabaceae	Touch me not	Athipathi Aku	Touch Sense
2	<i>Neptunia oleracea</i> Lour.	Fabaceae	Sensitive Water Plant	Nirutalavapu	Touch Sense
3	<i>Mimosa natans</i> L.f.	Fabaceae	Yellow Sensitive Plant	Chinna nidra kanti	Touch Sense
4	<i>Dionaea muscipula</i> J.Ellis	Droseraceae	Venusfly Trap	Fly Trap	Touch Sense
5	<i>Vitis vinifera</i> L.	Vitaceae	Grapes	Draksha	Visionary and Touch Sense
6	<i>Impatiens bequaertii</i> De Wild.	Balsaminaceae	Dancing Girl Impatiens	Dancing Impatiens	Visionary Sense
7	<i>Oncidium altissimum</i> (Jacq.) Sw.	Orchidaceae	Dancing lady orchids	Dancing lady	Visionary Sense
8	<i>Butea monosperma</i> (Lam.) Kuntze	Fabaceae	Flame of Forest	Modhuga	Visionary Sense



9	<i>Caleana major</i> R.Br.	Orchidaceae	Large duck orchid	Flying duck orchids	Visionary Sense
10	<i>Helicteres isora</i> L.	Malvaceae	Indian Screw tree	Gubbathada	Visionary Sense
11	<i>Pecteilis radiata</i> (Thunb.) Raf.	Orchidaceae	White egret flower	Flying Bird	Visionary Sense
12	<i>Peristeria elata</i> Hook.	Orchidaceae	Dove orchids	Pavurapu Orchids	Visionary Sense
13	<i>Helianthus annuus</i> L.	Asteraceae	Sunflower	Podhuthेरugudu Puvvu	Visionary Sense
14	<i>Zea mays</i> L.	Poaceae	Maize	Mokka Jonna	Smell Sense
15	<i>Solanum lycopersicum</i> L.	Solanaceae	Tomato	Ramachilaka pandu	Smell Sense
16	<i>Salix tetrasperma</i> Roxb.	Salicaceae	Willow Trees	Konda Ganneru	Smell Sense
17	<i>All Mangrove Plants</i>		Mangrove plants	Mada Adavi	Respiratory and Taste Sense
18	<i>Avicennia germinans</i> (L.) L.	Acanthaceae	Black Mangrove	Nalla Mada	Respiratory and Taste Sense
19	<i>Utricularia</i> sps, <i>Sarracenia</i> sps.		Carnivorous Plants	Kitakaahara Mokka	Taste Sense
20	<i>Nepenthes khasiana</i> Hook.f.	Nepenthaceae	Indian Pitcher Plant	Kitakaahara Mokka	Taste Sense
21	<i>Nepenthes ventricosa</i> Blanco	Nepenthaceae	Smooth Pitcher Plant	Buddha Kitakaahara Mokka	Taste Sense
22	<i>Oenothera drummondii</i> Hook.	Onagraceae	Evening Primrose	Sayanthram Primrose	Hearing Sense
23	<i>Pisum sativum</i> L.	Fabaceae	Pea	Batani Ginjal	Hearing Sense
24	<i>Camissoniopsis cheiranthifolia</i> (Hornem. ex Spreng.) W.L.Wagner & Hoch	Onagraceae	Suncups	Beach Suncups	Hearing Sense
25	<i>Arabidopsis thaliana</i> (L.) Heynh.	Brassicaceae	Mouse-ear cress	Thale cress	Hearing Sense

Important Difference: Animals have neurons and brains, while plants rely on chemical and electrical signaling without nerves. The function is similar (detect and respond), but the structure is different (Shiu and Blecker, 2001; Rensing *et al.*, 2008).

Table 2. Genes Involved in Sense

Function	Plant Gene Example	Animal/Human Equivalent
Sugar sensing	HXK1 (Hexokinase)	HK1, HK2 (Human hexokinases)
Ion channels	GLRs (glutamate receptors)	NMDA/AMPA receptors
Defense receptors	FLS2 (PRR)	TLR4 (Toll-like receptor)
Transporters	SWEET genes	SGLT, GLUT (sugar transporters)
Signal messengers	G-protein subunits	G-proteins (e.g., GNAS, GNB)

Similarities genes plant and animals like vision senses: Yes, plants and animals share some similarities at the genetic and molecular levels, especially in how they sense and respond to environmental stimuli - even though plants don't have eyes, ears, or a nervous system. Some genes and molecular pathways involved



in sensory perception show evolutionary parallels or functional analogies between plants and animals (Chamovitz, 2012; Toyota *et al.*, 2018).

Examples: Vision-like Sensing: Light Perception Genes

Plants and animals both have genes related to light sensing, although the structures (eyes vs. photoreceptors) are different (Lin and Todo, 2005; Chaves *et al.*, 2011).

Table 3. Plants and Animals Both have Genes Related to Light Sensing

Feature	Plants	Animals	Similarity
Light-sensing genes	Phototropins, Phytochromes, Cryptochromes	Cryptochromes (also in insects, mammals)	Both use cryptochromes to sense blue light and control circadian rhythms.
Function	Control growth direction, flowering, circadian rhythm	Regulate sleep-wake cycles, retinal development	Shared evolutionary origin (homologous genes)

Table 4. Signal Transduction and Neurotransmitter-like Molecules

Function	Plants	Animals	Similarity Type	Reference
Light sensing	Cryptochromes, phytochromes	Cryptochromes	Homologous genes	1. Chaves <i>et al.</i> , (2011).
Mechanical sensing	MSL channels	Piezo channels	Analogous (functionally similar)	1. Haswell and Peyronnet, (2021). 2. Syeda <i>et al.</i> (2016).
Neurotransmitter signaling	Glutamate-like signaling	Glutamate (synaptic) signaling	Homologous genes	1. Toyota <i>et al.</i> , (2018).
Internal clock	TOC1, LHY, CCA1	CLOCK, BMAL1	Functional parallel	1. McClung (2006). 2. Takahashi (2017).
Electrical signaling	Action potentials in Venus flytrap	Neuronal action potentials	Analogous	1. Hedrich <i>et al.</i> , (2016). 2. Böhm <i>et al.</i> , (2016).

Table 5. Some Popular Examples of Plants Having Vision Sense

S. No.	Scientific name	Family	Common name	Vernacular name	Sense
1	<i>Impatiens bequaertii</i> De Wild.	Balsaminaceae	Dancing Girl Impatiens	Dancing Impatiens	Visionary Sense
2	<i>Oncidium altissimum</i> (Jacq.) Sw.	Orchidaceae	Dancing lady orchids	Dancing lady	Visionary Sense
3	<i>Butea monosperma</i> (Lam.) Kuntze	Fabaceae	Flame of Forest	Modhuga	Visionary Sense
4	<i>Caleana major</i> R.Br.	Orchidaceae	Large duck orchid	Flying duck orchids	Visionary Sense
5	<i>Helicteres isora</i> L.	Malvaceae	Indian Screw tree	Gubbathada	Visionary Sense
6	<i>Pecteilis radiata</i> (Thunb.) Raf.	Orchidaceae	White egret flower	Flying Bird	Visionary Sense
7	<i>Peristeria elata</i> Hook.	Orchidaceae	Dove orchids	Pavurapu Orchids	Visionary Sense
8	<i>Vitis vinifera</i> L.	Vitaceae	Grapes	Draksha	Visionary and Touch Sense



9	<i>Antirrhinum majus</i> L.	Plantaginaceae	Snapdragon	Purre Kaya	Visionary Sense
10	<i>Palicourea elata</i> (Sw.) Borhidi	Rubiaceae	Hooker's Lips true flowers	Lips Flowers	Visionary Sense
11	<i>Solanum mammosum</i> L.	Solanaceae	Nipple Fruit	The Pig Face fruit	Visionary Sense
12	<i>Impatiens psittacina</i> Hook.f.	Balsaminaceae	Parrot Flower	Chiluka Puvvu	Visionary Sense
13	<i>Monilaria obconica</i> Ihlenf. & S.Jörg.	Aizoaceae	Rabbit Succulents	Bunny ears.	Visionary Sense
14	<i>Dracula simia</i> (Luer) Luer	Orchidaceae	Monkey Face Orchid	Kothi Orchid	Visionary Sense
15	<i>Asplenium nidus</i> L.	Aspleniaceae	Bird Nest'S Fern	Pakshi Gudu	Visionary Sense
16	<i>Crotalaria cunninghamii</i> R.Br.	Fabaceae	Greenbird Flower	Tella Pakshi	Visionary Sense
17	<i>Monilaria obconica</i> Ihlenf. & S.Jörg.	Aizoaceae	Dolphin Succulent	Jemudu Dolphin	Visionary Sense
18	<i>Lithops fulviceps</i> (N.E.Br.) N.E.Br.	Aizoaceae	Living Stones	Pebble Plant	Visionary Sense
19	<i>Ophrys insectifera</i> L.	Orchidaceae	Fly Orchid	Kitaka Orchid	Visionary Sense
20	<i>Lithops pseudotruncatella</i> (A.Berger) N.E.Br.	Aizoaceae	Living Stones	Pebble Plant	Visionary Sense
21	<i>Lithops karasmontana</i> (Dinter & Schwantes) N.E.Br.	Aizoaceae	Living Stones	Pebble Plant	Visionary Sense
22	<i>Actiniopteris radiata</i> (Sw.) Link	Pteridaceae	Mayura shiki	Nemali Picham	Visionary Sense
23	<i>Davallia solida</i> var. <i>fejeensis</i> (Hook.) Noot.	Polypodiaceae	Rabbit foots Fern	Kundhelu Kallu	Visionary Sense
24	<i>Euphorbia tithymaloides</i> L.	Euphorbiaceae	Slipper Spurge	Zigzag Plant	Visionary Sense

The above plants demonstrate **vision sense** through their **shapes, colors, and forms** that resemble animals, birds, insects, and objects. This means they appeal to our **sense of sight** because: They **look like familiar creatures** (e.g., birds, monkeys, rabbits). Their shapes often **mimic living things**, surprising and fascinating people who see them. Some use this mimicry for **pollination**, attracting insects or animals by resembling something familiar. Like *Impatiens bequaertii* looks like a tiny bird dancing in the air. *Oncidium altissimum* has flowers shaped like a lady dancing with a big skirt. *Butea monosperma* has red flowers that look like a bird. *Caleana major* is known for flowers that look like ducks flying. *Helicteres isora* has parts that look like a parrot. *Pecteilis radiata* has white flowers that look like a bird flying. *Peristeria elata* has flowers that look like a white dove. *Vitis vinifera* is a grape plant and relates to taste and senses. *Antirrhinum majus* is called snapdragon because it looks like a dragon's face that can open and close. *Palicourea elata* has red parts that look like human lips. *Solanum mammosum* has fruits that look like a pig's face. *Impatiens psittacina* has flowers that look like a flying parrot. *Monilaria obconica* has two parts that look like bunny ears. *Dracula simia* has flowers that look like a monkey's face. *Asplenium nidus* is a fern that looks like a bird's nest. *Crotalaria cunninghamii* has flowers that look like green birds. *Monilaria obconica* (again) can also look like dolphins jumping. *Lithops fulviceps* is a plant that looks like small stones. *Ophrys insectifera* has flowers that look like a flying insect. *Lithops pseudotruncatella* also looks like small stones. *Lithops karasmontana* is another plant that looks like pebbles. *Actiniopteris radiata* is a fern with leaves like peacock feathers. *Davallia solida* var. *fejeensis* has furry roots that look like rabbit feet. the above plants demonstrate **vision sense** through their **shapes, colors, and forms** that resemble animals, birds, insects, and objects. This means they appeal to our **sense of sight** because: They **look like familiar creatures**



(e.g., birds, monkeys, rabbits). Their shapes often **mimic living things**, surprising and fascinating people who see them. Some use this mimicry for **pollination**, attracting insects or animals by resembling something familiar.

How Do Plants "Feel" Touch: Plants detect touch through mechanoreceptors. These are the proteins that respond to mechanical stimuli like pressure, vibration or bending. When plants are touched, these receptors trigger electrical and chemical signals that alters plant growth or movement (Jaffe *et al.*, 2002; Malabarba *et al.*, 2019; Darwish *et al.*, 2022). Touch causes changes in ion flow, particularly calcium ions. These signals travel through plant tissues similarly to electrical signals in animal nerves, though at lower speed. This can lead to changes in gene expression, hormone levels and even in defense mechanisms. *Mimosa pudica* (Sensitive Plant) folds its leaves rapidly when touched. This is a thigmonastic response, it does not depend on the direction of the stimulus. This phenomenon helps the plant to Protect from herbivores or environmental stress. Venus Flytrap has tiny hairs on its leaves, when touched twice in quick succession, it causes the trap to snap shut. This active movement is triggered by mechanical stimulation. Climbing Plants (e.g., Peas, Vines) Show Thigmotropism (growth in response to touch), as they coil around and supports as they grow, thigmonasty (movement in response to touch). This touch-driven growth helps the plant to reach light more efficiently (Jaffe *et al.*, 2002; Braam, 2005; Börnke and Rocks, 2018; Malabarba *et al.*, 2019).

Do Plants Taste: Plants don't "taste" in the way animals do (with tongue and taste buds), but they can detect and respond to chemical substances in their environment, especially in soil at cellular level. This phenomenon is equivalent to the sense of taste, often referred to as chemo sensing or chemical detection (Jaffe *et al.*, 2002; Malabarba *et al.*, 2019; Darwish *et al.*, 2022). Chemical receptors (usually proteins embedded in cell membranes) which help them to detect specific molecules such as nutrients, toxins, or signaling compounds (Gilroy *et al.*, 2016). These receptors trigger cellular responses like changing the direction of root growth, modifying nutrient uptake, Activating defense mechanisms.

The below table highlights a few unique plants that exhibit taste and respiratory-like senses. Mangrove species such as *Avicennia germinans* demonstrate both taste and respiratory adaptations, especially in saline environments where their roots filter salt and absorb oxygen through specialized structures. Carnivorous plants like *Utricularia*, *Sarracenia*, and *Nepenthes* species possess a taste sense, allowing them to detect, digest, and absorb nutrients from trapped prey—an adaptation to nutrient-poor soils. These plants showcase how chemical sensing and nutrient detection mirror taste perception in animals, despite the absence of traditional sensory organs.

Table 6. Some Popular Examples of Plants Having Taste Sense

S. No	Scientific name	Family	Common name	Vernacular name	Sense
1	<i>All Mangrove Plants</i>	-	Mangrove plants	Mada Adavi	Respiratory and Taste Sense
2	<i>Avicennia germinans</i> (L.) L.	Acanthaceae	Black Mangrove	Nalla Mada	Respiratory and Taste Sense
3	<i>Utricularia</i> sps, <i>Sarracenia</i> sps.		Carnivorous Plants	Kitakaahara Mokka	Taste Sense
4	<i>Nepenthes khasiana</i> Hook.f.	Nepenthaceae	Indian Pitcher Plant	Kitakaahara Mokka	Taste Sense
5	<i>Nepenthes ventricosa</i> Blanco	Nepenthaceae	Smooth Pitcher Plant	Buddha Kitakaahara Mokka	Taste Sense



Results and Discussion

Can plants hear: Yes, plants can hear in biological sense. plants have ability to detect and respond to sound vibrations in their environment (Appel and Cocroft, 2014). Plants use mechanoreceptors (sensitive to mechanical forces like touch or vibration) to sense sound waves. When sound vibrations travel through air and hit plant tissues, then mechanoreceptors can trigger biochemical responses (Mishra *et al.*, 2016). *Arabidopsis* plant when subjected to certain frequencies from 200-300 Hz, shown changes in gene expression and growth (Ghosh *et al.*, 2016).

In pea plant experiments, roots grew towards the sound of flowing water even when there was no direct moisture, this also indicates sound might guide them (Gagliano *et al.*, 2017). Few plants increase production of defensive chemicals when they "hear" the chewing vibrations of caterpillars on or nearby leaves. Hence, we can say sound detection helps plants to anticipate threats like herbivores. (Appel and Cocroft, 2014). Some research hints that sound might affect seed germination, flowering and growth of root direction. Their "hearing" is biophysical in nature (Gagliano *et al.*, 2012).

How do Plants Detect Light: Plants don't have eyes, but they can detect light direction, intensity, duration, and wavelength using specialized photoreceptors? Photoreceptors are proteins that absorb light and trigger changes in growth or behavior of the plant. This ability allows plants to respond to their environment in ways that mimic vision at a biochemical level through light-sensitive molecules that help them to "sense" light and react accordingly (Appel and Cocroft, 2014). Phytochromes are the pigments that detect red and far-red light which are important for day & night cycles and shade detection. Cryptochromes detect blue and UV-A light which help regulate circadian rhythms. Phytotropins sense blue light and help to direct plant growth towards light and this phenomenon is known as phototropism. UVR8- Senses UV-B radiation which triggers protective responses to UV stress (Rodrigo *et al.*, 2017).

Light Direction → Grow toward light (phototropism). Light Duration → Time of flowering (photoperiodism). Light Quality → Detect shade or competition from other plants. Light Intensity → Adjust photosynthesis and pigment production. For example, sunflowers track the sun movement across the sky during the day using photoreceptors behavior called heliotropism. At night, they reorient to face east again by anticipating sunrise (Gilroy & Masson, 2008; Rodrigo *et al.*, 2017).

Sight or Visionary sense in Plants: Plants don't form images or "see" in the visual sense, but their ability to detect and react to light stimuli is complex and adaptive, which is similar to the function of vision in animals (Trewavas, 2005; Christie, 2007; Lamb, 2013). The phrase "visual sense in plants" can be interpreted in few different ways depending on context. Here are some possible meanings and elaborations. Few people believe that plants have a kind of sense or awareness, even without possessing nervous system like animals. Scientific research has proved that plants can respond to light, gravity, and touch (tropisms) (Darwin, 1880; Gilroy & Masson, 2008; Chaves *et al.*, 2011; Chamovitz, 2012). They can communicate with each other through chemical signals by releasing pheromones when they are under threat. They remember the environmental stress and adapt over time. Plants also Interact symbiotically with fungi and microbes in the soil. So, "visual sense in plants" might mean recognizing that plants have sophisticated ways of sensing and responding to their environment.

Similar genes of plant and animals are involved in plant taste and digestion sensing: Yes, plants and animals share some similar genes and molecular pathways, even for functions like taste, smell, and digestion-related sensing, though they are used in different ways. Here are some key similarities in sensory and digestive-related genes between plants and animals:

Receptor-Like Kinases (Sensing Chemicals / Taste / Smell): Plants have receptor-like kinases (RLKs) and G-protein coupled receptors (GPCR-like proteins) to detect sugars, hormones, toxins, and pathogens. Animals use GPCRs for taste and smell—detecting molecules like sweet, bitter, heat or pheromones.



Similarity: Both have membrane-bound receptors that detect external molecules and activate internal signaling (Moriyama *et al.*, 2006; Afzal *et al.*, 2008).

Sugar Sensing (Taste / Metabolism): Plants sense sugars like glucose, sucrose, fructose using Hexokinase (HXK) and Sweet transporters. Animals, including humans, also use hexokinases and GLUT transporters in glucose metabolism and sensing. Similarity: Shared sugar sensing and metabolic pathways (Rolland *et al.*, 2006; Lemoine *et al.*, 2013).

ATPases and Digestive Enzymes: Plants secrete enzymes (like proteases, lipases, and amylases) to break down food-like materials (especially in carnivorous plants). Animals use similar digestive enzymes in the stomach and intestine. Similarity: Genes for basic enzyme functions (e.g., hydrolases) are conserved (Hatano and Hamada 2008; Schulze *et al.*, 2012).

Defense and Immune-Like Sensing: Plants have pattern recognition receptors (PRRs) to detect pathogens, triggering immune responses. Animals have Toll-like receptors (TLRs) that detect microbial molecules. Similarity: both plants and animals detect pathogen-associated molecules using receptor-based systems and signal transduction (Ausubel, 2005; Zipfel, 2008).

Ion Channels and Signal Transmission: Plants use ion channels (E.g., calcium channels) for sensing touch, damage, and gravity. Animals use ion channels in nerves, including taste and smell pathways. Similarity conserved ion-based signaling systems (Chiu *et al.*, 2002; Toyota *et al.*, 2018).

Where and Why Plants "Taste": Roots are the primary tasting organs help them to detect Water, minerals (like nitrate, phosphate), salts, heavy metals, and pH. After detection in response to that roots grow toward beneficial substances and away from harmful ones. Plants don't have brains or emotions, so "taste" is not conscious. Their detection is chemical and automatic, driven by evolution to maximize survival and reproduction. Roots of some plants detect high salt concentrations and grow away to avoid stress. Leaves and stems, can detect pathogen-associated molecules or airborne chemicals from other plants and then respond by activating chemical defenses or signaling pathways (Gilroy *et al.*, 2016). Seeds and pollen also can "taste" the chemical environment to decide whether to germinate or grow. Nutrient Foraging: Roots detect nitrate-rich zones and preferentially grow toward them. In the *Nepenthes* sp. and *Utricularia* sp., plants do not have digestive system as animals possess. Instead, they produce their own food through photosynthesis, using sunlight, water, and carbon dioxide to create sugars. Carnivorous plants have developed specialized mechanisms, primarily modified leaves helps them to digest and absorb nutrients from trapped prey (Matthias *et al.*, 2022). Microbe Detection: Plants can identify harmful or helpful microbes and respond differently (e.g. rejecting pathogens, inviting beneficial fungi or bacteria) (Jaffe *et al.*, 2002; Malabarba *et al.*, 2019).

Plants also have Gravitropism – Sense gravity to direct root and shoot growth. Magnetoreception – Possible magnetic field detection (studies ongoing). Hydro sensing – Sense water availability and move roots accordingly. Electroreception – Respond to electrical signals and fields (Gilroy *et al.*, 2016; Malabarba *et al.*, 2019).

Conclusions

Plants don't have eyes, ears, nose and tongues, but they use proteins and biochemical pathways to sense and respond to light, chemicals, touch, sound, and more. Their sensory world is silent and invisible to us, but it's incredibly rich, adaptive, and intelligent in its own way. Apart from the basic Five Senses. Even without brains or eyes, plants use similar molecular building blocks to detect and respond to their environment. These shared elements suggest that plants and animals inherited core molecular systems from a common ancestor over 1 billion years ago. Molecular and chemical sensing mechanisms involved in signal perception, transduction and responses needs to be enumerated in some senses.



Acknowledgement

The Authors (Veera Kishore) is grateful to Prof. Mallikarjuna Kokkanti, Head of the Botany Department, Acharya Nagarjuna University for providing facilities and encouragement during the course of work. We are also thankful to Andhra Pradesh State Forest Department, for necessary permission and logistic support in conducting field studies.

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