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STUDIA
ECOLOGIAE
ET BIOETHICAE



20/2 (2022)

The Importance of Plants in Ancient Cultures Against the Background of New Research Concerning Intelligence of Plants

Znaczenie roślin w kulturach starożytnych na tle nowych badań nad inteligencją roślin

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Received: 02 Mar, 2022; Revised: 26 Apr, 2022; Accepted: 27 Apr, 2022

Abstract: Juicy fruit, healthy vegetables, herbs for all the ailments, delightful flowers, a shelter under the spreading branches of an old tree - can plants be something more for man, and can they be even equal to him? Where is their place in the world, which is dominated by man and his helpers - animals? This article leads the reader through the thoughts and beliefs of ancient peoples, showing their respect for everything that lives until the modern times, when scientists try to relate the definition of intelligence and consciousness to plants. Myths from various parts of the globe, illustrate how important a role plants had in the past, that they were much more than food, medicine, or refuge. Since the beginning of time, without new technologies, people felt the power of nature and respected the otherness of creatures, wandering with them, step by step, with fear and awe. Plants, though "immobilised", could create, and decided on the world's fate, and were messengers between men and other organisms, an essential link, unique and holy. Today, when one can analyse plants' functions and behaviour, observe how they communicate with the world, using all of the senses not located in specific organs, but spread all over the organism, man starts to notice what his ancestors saw a long time ago: that plants remember, decide, learn and give humans a wide range of opportunities. Having far more senses than man, showing humans a different kind of consciousness and intelligence, not centralised, to which one is used to, but dispersed, though not less efficient, plants are becoming very interesting subjects of scientific research.

Keywords: plants, intelligence, consciousness, senses, human, gods, myth

Streszczenie: Soczyste owoce, warzywa dla zdrowia, zioła na wszelkie dolegliwości, zachwycające kwiaty, schronienie pod rozłożystymi konarami starych drzew - czy rośliny mogą dać człowiekowi coś więcej, czy mogą równać się z człowiekiem? Gdzie jest ich miejsce w świecie zdominowanym przez człowieka i jego pomocników - zwierzęta? Niniejszy artykuł prowadzi czytelnika poprzez myśli i wierzenia starożytnych ludów, pokazując ich szacunek wobec wszystkiego, co żyje aż do czasów współczesnych, gdzie naukowcy zmagają się z definicją inteligencji i świadomości w odniesieniu do roślin. Mity wielu krajów świata pokazują jak ważną rolę miały do spełnienia rośliny, że były czymś więcej niż pokarm, lek czy azyl. Od początków świata, bez nowoczesnych technologii, ludzie czuli potęgę natury i respektowali inność stworzeń, krocząc obok nich z podziwem i strachem. Rośliny, choć „unieruchomione”, potrafiły stwarzać, decydowały o losach świata, były pośrednikami między ludźmi i innymi organizmami, niezbędnym ogniwem, wyjątkowym i świętym. Dzisiaj, gdy możemy już zbadać zachowanie i funkcje życiowe roślin, gdy obserwujemy, jak komunikują się ze światem swymi zmysłami, nieskupionymi wokół konkretnych narządów, ale płynnie rozszanymi po całym organizmie, człowiek zaczyna dostrzegać to, co widzieli już jego przodkowie: że rośliny pamiętają, decydują, uczą się i dają nam wiele możliwości. Mając o wiele więcej zmysłów niż człowiek, pokazując ludziom inny rodzaj świadomości i inteligencji, nie scentralizowanej, do jakiej

zostaliśmy przyzwyczajeni, ale rozproszonej, lecz wcale nie mniej skutecznej, rośliny stają się ciekawymi obiektami do badań naukowych.

Słowa kluczowe: rośliny, inteligencja, świadomość, zmysły, człowiek, bogowie, mit

Introduction

In the beginning of human existence on earth, man's only goal was to survive. In very simple terms, one may state that ancient peoples struggled to survive in two ways: firstly, they tried to understand the surrounding nature and the processes governing it, and secondly, they worshipped the gods, since prayers, rituals and sacrifices might ensure their life in prosperity. Each mythology contains stories about the beginning of the world, how the first men and all the creatures emerged on earth. Most of the stories are focused on animals which were treated with great respect because people were afraid of their strength and wildness, and at the same time admired how they could fly, hunt and kill. Man wanted to possess the knowledge about all of it, to make the world his own. Many gods and goddesses were imagined as half-men, half-animals and there were also animals that helped people to create the world or even man himself. What about plants? Man could not remain indifferent to their presence around him, especially when only 0,5% of the total biomass on earth stands for animals and human beings, the majority of it being the vegetation (Mancuso and Viola 2017). Obviously, plants were an important supplement of man's meat diet, people also discovered the curative qualities of plants, but is that all, or maybe there was something more about them? Did people talk to plants, consider their power; could they determine some processes on earth without which men could not exist or function?

Man noted the things he could understand and referred all the experiences he got from the environment to himself, hence the anthropomorphic tendencies to assign human characteristics to the world, both to animals

and plants. The uniqueness of man is indisputable, that is why, it is difficult to refer to arguments concerning the existence of consciousness in plants, also because scientists are not sure how consciousness and subconsciousness work in people. Because of the fact that the presence of consciousness in plants is a phenomenon so different from the one of humans, people cannot recognize or identify it (Nick 2021).

From the modern perspective, it can be assumed that by comparing plants to animals, man deprived them of their individuality. Even though, plants do not have such organs as humans, they have been equipped by evolution with a specialised group of qualities that are used by them for specific purposes and in various situations which may lead to the idea of their having a certain kind of consciousness. Man in ancient cultures and tribes attributed unexplained and mysterious aspects of plants' biology to gods' intervention, since he did not have the tools that modern scientists have. Today researchers know much more.

Can "plant intelligence" be a fact? Scientists present various definitions of intelligence and a lot of arguments for or against conscious communication between plants and other living organisms. It is known that plants gather information from the environment using all sorts of sensors, and they react to stimuli from the surroundings, but plants can also send signals to other organisms like fungi or insects (Mescher and de Moraes 2015).

Colloquially speaking, one may say that plants live "on the verge", on the border of two worlds. The fact was acknowledged by people from ancient cultures, who showed that trees can touch the sky with their branches and reach the realm of the dead

by their roots. Plants have to cope with two contrasting worlds: the pedosphere which is underground and the atmosphere above them. One single organism of a plant is both autotrophic shoots, constantly liable to changing cycles of day and night, and heterotrophic roots remaining in the underground darkness, yet staying in a more stable environment (Baluška and Mancuso 2021). The evolution compensated the fact that plants are immobile with a special “package” of adaptation to help plants reproduce successfully. A plant which interacts with bees or moths uses a variety of ways to attract insects to ensure its own reproduction, spreading and protection (Baluška and Mancuso 2021). In its “survival kit”, a plant has also such features as colour of flowers, their scent, size, shape, and symmetric structure. It has been proved that plants quite consciously attract specific species of pollinators which do their job in the best way to secure survival and continuity of a plant’s species (Balamurali et al. 2015). Let us carry on with the theory that plants have memory and are able to learn. Because of the fact that plants cannot move from one place to another, the cognitive processes like decision making are necessary for them to live. Plants can join the spectrum of stimuli and change them into a single signal which activates the whole organism to react to those stimuli (Baluška et al. 2018). It was Darwin who noticed that a plant has hundreds of “brains” on the apices of its roots, which are set in a certain position to communicate simultaneously with every part of the plant. Such a system enables a plant to gather all its previous experiences, compare them with the present ones to react in a better way in the future (Baluška et al. 2018).

This article reflects on the meaning of plants in human life on the basis of mythological stories of ancient cultures to emphasize that already centuries ago, people valued plants, treated them with respect and considered as equal to humans. The main focus has not been put on the most basic connections between man and plants such as

food or medical treatment. The purpose has been to find out and show that in the past plants were treated at the same level as animals or even humans. Some plants were treated as gods and goddesses, and they were believed to contribute to the creation of the world and men. It seems that people living long time ago somehow knew, without any scientific tools and knowledge, that plants are intelligent beings, a belief that is now still under debate of scientists. The first part of the article explains the role of plants in the creation of the world: the earth itself and the celestial bodies. The second part continues the previous thought and shows how plants became an integral part of man and to what extent plants helped in the appearance of the first human being on earth. Part three presents a vivid and colourful pantheon of gods and goddesses, protectors of plants or even in a shape of plants in various cultures. Part four relates the modern research concerning plants’ senses to beliefs and rituals of ancient peoples who, as it is concluded, noticed signs and manifestations of sight, touch, smell, hearing, and taste in plants since they were considered living beings. In the last part, the question about morality has been put; can plants be good or evil, can they decide and choose which is directly linked to the idea of consciousness in the world of plants.

1. Plants and the beginning of the world

In the course of evolution, plants evolved from aquatic organisms to become the most complicated vascular organisms as huge as *Sequoiadendron giganteum* or as old as *Pinus longaeva* (Baluška and Mancuso 2021). There are not many myths describing the creation of the earth in which plants would play a major role, but very often, they are told to have emerged before the animals. More often, plants were presented as helpers or one of the elements in the great construction of the universe. Parts of plants have been used in proverbs and sayings in many languages up to this day, yet they were used much earlier by ancient cultures. The people

from Hawaii imagined the world as a fruit of *Calophyllum* – heaven was made from its skin, the sun from its pulp, the moon from its white phloem, seeds became stars and juice run down as the first rain (Juszczak 2007b). Other peoples from Oceania saw the earth as a huge coconut of a very complicated structure (Juszczak 2007b).

In every landscape around the world, trees were the most important. Because of their longevity and structure, trees were treated as holy beings, able to contact with other worlds. Manusco and Viola call the trees “very slow” in comparison with men, yet it is not a pejorative quality (2017). This feature is an asset since trees seem to be beings that can remember the past which makes them very wise and powerful.

Trees are a very crucial element of the natural ecosystem, but they are also ecosystems themselves, mythical ecosystem as well. Many ancient cultures imagined the world as a huge tree – those “living structures” were called the World Tree, *axis mundi*, or the Cosmic Axis. Basically, it was an ash or an oak, old tree with spreading treetops and numerous, strong branches. The one, presented by the Norse in so many details, was Yggdrasil – the ash which carried 9 worlds on itself: places for gods, people, dwarves, elves and giants. The giant ash of the North had 3 roots, and one of them, which led to the realm of the Asgard gods, was being watered by the Norns, the deities and prophetesses. The dragon Nidhǫgg that was sucking corpses in the land of the dead, was trying to bite off the second root, but it was always growing again; the third root led to the land of the giants (Skibicka 2007a). Yggdrasil was the home of many species of animals: 4 deer symbolising four corners of the world, the eagle on the top of the tree and the squirrel Ratatoskr which was always running up and down the trunk of the tree sending insults from the eagle of Asgard to the snake of the underworld. This tree was not only the support of the worlds, but also a place of the suffering of the father of all the Asgard gods – Odyn, who was

hanging on it for 9 days and nights to acquire the wisdom of the world and pass it on to people (Skibicka 2007a). A similar vision of the World Tree can be found in Slavic mythology, this time, it was an oak or a linden. The god Svarog threw a stick into the water and in that place the tree grew, determining 4 directions of the world. Another myth says that the World Tree was not created, but it was there at the beginning, in the centre of the earth, together with the Primeval Ocean and two gods in the shape of birds (Skibicka 2007b). Maya imagined the Cosmic Axis as a great *ceiba*, a wild cotton tree with a heavenly bird on the top of it. When the boy K’ox scattered cotton seeds, first bees emerged which seems to be the beginning of a close relationship of insects and plants (Mazur and Skibicka 2007). The cotton tree had 13 levels and was held by 4 gods (Mazur and Skibicka 2007).

Mysteries, something different than usual, were considered to be unnatural and as such – dangerous. If someone was murdered or died in tragic circumstances such as a woman giving birth to her child or a young couple during their wedding, special rituals had to be made in order to prevent the dead body from returning to the world of the living as a ghoul or other demon. In the meantime, in the culture of Maya, the tormented souls of such people had an easier way to get to the peaceful afterlife. Their journey was less dangerous, without traps and ambushes, and people could sit in the pleasant shadow of the holy tree (Mazur and Skibicka 2007). In areas of today’s Mexico, there were peoples who saw an *axis mundi* as a corn cob (Mazur and Skibicka 2007). The symbolic meaning of that plant, widespread in South America, will be discussed in more detail below. The Persians called their holy tree the Tree of All Seeds because their god, who was the protector of all the vegetation, during the fourth fight with the forces of darkness, collected all the seeds from every plant to save the flora. In the branches of the Tree, the mythical bird Simorg had its nest. There was also the fifth fight, when evil Angra

Mainju killed the first cow. Ahura Mazda, the godly guardian, knew that this might happen, so he had earlier stunned the cow with cannabis, and from the dead animal all the crop plants emerged. From the first man all metals were made of, including the most important – gold. What is really interesting that from gold the first rhubarb grew (Juszczak 2008). In this way, all the living organisms came to life: plants, animals and human beings who helped each other becoming creators and creations at the same time.

What happens when plants are left without any control? The Giant Oak from the Finnish tale was growing unstoppable until its top reached the sky, and one of the clouds stuck in its branches. Because of that, the rain was falling for many days and nights. The Sun and Moon got in the way of the Giant Oak's treetop, and it was very cold. Then, the little dwarf came, who cut the tree with one strike of a golden axe. The part of the treetop crushed the firmament and the stars which stayed there became the Milky Way (Ragache 1991). Tane, the god of forests, who grew first trees and other plants, did it in a special way – upside down, and that was the beginning of mangrove forests in Polynesia (Juszczak 2007b).

2. Plants and the creation of man

Man in many cultures was seen a mixture of elements, that is why, in the process of creation, plants and animals were involved. Peoples around the world appreciated the existence of both plants and animals and their gods used other creatures as “ingredients” to make man. Reading the Maya mythology, one may have an impression that for those people everything in human life depended on one plant – the corn. The first four men were made of white and yellow ground corn seeds (Ragache 1991). After that, the rain god struck with a thunderbolt from the sky, and burnt the corn, creating other forms of corn: red and black (Mazur and Skibicka 2007). According to Maya, human-kind was born thanks to *mais* (corn) and

after one's death the ground lumps of corn were put into his mouth which symbolised rebirth (Mazur and Skibicka 2007). Celebrations and rites connected with corn will be described in the next parts of the article. The Incas had a similar vision of the creation of the first man who was supposed to have emerged from the soil and sprouted decorated with leaves just like plants. Inuit from Alaska believed that first humans fell off from the pods and they had been growing as seeds (Mazur 2008). For Slavic people, man was nothing more than a bunch of straw – the god Perun wiped in it giving human beings sweat and toil of hard work as an integrate part of our lives on earth. The god Weles helped in creating the first man from straw and Perun finished the creation by giving him the soul (Skibicka 2007b). The tribe of American Indians Kato from the northern California saw the first man as a being created from clay and grass: the stomach was filled with grass, smaller balls of grass became his organs and the stem of reed formed the trachea (Stasiszyn 2007b). Tangaroa, the god of the oceans, the elder brother of Tane, the god of forests, sent a bird Tuli to earth with the sapling of grapevine, yet men did not emerge from the sweet vine fruit. The bush grew high and wide but withered and fell into pieces because no one took care of it or watered it. Diligent larvae living underground, dug out grapevine's roots and Tangaroa collected them. He gave the roots a human form and added the heart and soul (Juszczak 2007b).

Human wisdom might have something in common with the belief that in many cultures people were old trees. In the Norse mythology, Odin, the father of all gods, together with his brothers, built the first couple of two tree logs they found at the beach: the man (Aske) from an ash and the woman (Emble) from an alder (Skibicka 2007a). According to the Nivkh tribe from Siberia people were born out of trees: each tribe from a different species: birches, larches and firs (Kurek 2008b). Some of African peoples believed that man was an offspring of plants,

soil and animals or a child of earth and the papaya tree (Cieślewska 2007a). This is not surprising that man needs plants around him every day if they are integral elements of his entity.

3. Plants as gods and goddesses

Heathen peoples treated nature as *sacrum* and worshipped it. The Slavs had their sacred groves: the pristine places in primeval forests, untouched by the hand of man, allowed to enter only for the chosen ones or only in certain seasons, holidays and rituals. Everything that was part of such a landscape or rather an ecosystem: from springs and lakes to rocks and trees, had magical power (Skibicka 2007b). The Celts also built sanctuaries away from their houses which were places of cult and prayer, where aged trees like oaks, ashes, yews and hazels symbolised wisdom and existence (Kałużna-Ross 2007b). For African tribes, holy places were everywhere, there were no borders and no time (Cieślewska 2007a). Trees were everywhere, even in heaven, and the stars were their roots – peoples from Siberia in such a picturesque way described nature (Kurek 2008b). The legendary land Avalon, a magical place where King Artur was taken after his death, corresponds with Annwn, The Isle of Apple Trees, the kingdom of the dead somewhere in Wales. Only Druids could enter that realm during their lifetime and delight themselves in trees that had fruit all year long, fertile land and flowers of thousands of colours (Kałużna-Ross 2007b). In Avalon, there was also the Rowan Tree of Wisdom and Inspiration. Its berries were falling into the stream and were eaten by fish: trout or salmon. A certain warrior called Finn caught such a fish one day and fried it in the fire. When he wanted to check if the fish was ready to eat, he burnt his thumb. To ease his pain, Fionn put the finger with a fish skin into his mouth and he possessed the knowledge about the world. When he was in trouble, Fionn always put his thumb into his mouth and found solution to his problem (Kałużna-Ross 2007b).

In almost every pantheon of gods there was a god or goddess of fertility and harvest. There was Demeter in Greece, Anahita in Persia, Nut in Egypt, Phoenicians worshipped Adonis – the personification of vegetation, the Incas had Pachamama with the hair of grass or Mama Coca from the coca leaves. Athena won with Poseidon when she gave to Athenians the best gift – an olive tree (Cieślewska 2007b). After Osiris died, wheat and herbs grew from his body (Bruce-Mitford 1997). The Aztec had Mayahuel with her plant agave. She was born as a woman feeding the world from her breast, sitting on the agave tree. She was called the Woman of Four Hundred Breasts what is related to a thick juice dripping from the agave (Kałużna-Ross 2007a). Odin with his brothers, Vili and Vé, killed the giant Ymir and from parts of his body, they created the world; for example, the grass was made from Ymir's hair (Skibicka 2007a). Saint Patrick, during his mission of Christianisation of Ireland, wanted to explain to the Druids the essence of the Holy Trinity. He did it on the example of a leaf of clover, a saint plant of the Celts known as Seamroy, and today's English word for it is *shamrock* (Kałużna-Ross 2007b).

A story from China is really interesting. It is about a man named Shennong who was a brother of the Yellow Emperor known to the Chinese people as the Great or the Divine Farmer. The sources indicate that he was a historical figure who analysed the qualities of plants. Supposedly, Shennong, for cognitive purposes, tasted all the plants he collected and was poisoned 70 times, yet after that, he could distinguish poisonous from healing herbs. The Divine Farmer also discovered the qualities of tea as a drink. He only drank warm, boiled water. One day, when he was resting under the tea tree, a few leaves fell into his teapot (Kurek 2008a). There is another, very tragic story, about how the first tea tree grew. Bodhidharma, a Buddhist monk, fell asleep during meditation and because he felt guilty about this fact, he decided to punish himself,

so he cut off his eye-lids, and threw them on the ground – from them the tree bush grew which could chase away the sleepiness and weariness. The king of all the tea trees is *qingmao* – its cultivation is kept in secret and only Chinese emperors are allowed to drink it (Kurek 2008a).

Most of us are enchanted by the beauty of flowers: their shapes, colours and smells. There are many stories telling about how this bouquet of species first appeared on earth. The first flower is known from Egypt and was an attribute of the god of Sun – Ra. The lily came out of Hera's milk, Iris got its name after the goddess Iris, and Brahma sat on the lotus flower when he was creating the world (Bruce-Mitford 1997). In many cultures, flowers are connected with a bloody history of martyrs. The colour of marigold was made from the Aztec's blood, murdered by Spanish conquistadors. Today, it is still called "the flower of 10 thousand years" and symbolises immortality (Bruce-Mitford 1997). Hyacinth was brought to life by Apollo who unintentionally killed his friend (Bruce-Mitford 1997). The passionflower, also called "the martyr" (in Polish *męczennica*), grew under the Christ's Cross, and its shape corresponds with the Saviour's wounds (Bruce-Mitford 1997). The red rose also symbolises Jesus Christ's blood and was always hanged over the table as a sign that the topic of this conversation had to remain secret (Bruce-Mitford 1997).

One of the holiest plants in South America is the corn. Starting from the very beginning, the corn flour was the building material of the humankind. The god of corn was imagined as a beautiful young man with shiny, silky hair, wearing a hat with the ear corn. When harvest came, the corn god was changing, and his attribute was a ripe corn cob (Mazur and Skibicka 2007). The Aztecs had their god Ometeotl with corn cobs and the goddess Xilonen whose name means "The one who walks like a young corn" (Kałużna-Ross 2007a). One of the legends says that one day the god Quetzalcoatl, called the helper of the humankind, saw

an ant which was carrying a corn seed. He forced it to show him the place from which it was taking the food; to do that, Quetzalcoatl had to change into an ant. Then he gave this special gift to humans (Kałużna-Ross 2007a).

Moreover, important holidays could not have been celebrated without a single element of a corn: incense was mixed with 49 corn seeds and then people made a ritual drink *chahalté* from such ingredients or drink *pikulakakla* from 415 fried corn seeds (Mazur and Skibicka 2007). The Inca and the Aztec used corn flour during ritual cleansing acts (Skibicka 2007c). In the calendar of the Aztec, there were holidays when they ate "human corn" which was human flesh boiled together with corn (Kałużna-Ross 2007a). Similarly, some of the North American tribes worshipped the Mother Corn who sacrificed her body, so that people could have food (Stasiszyn 2007b). During the Powamu ceremony (The Seed Dance) which lasted 16 days, the walls of the houses were decorated with the corn cobs and the worshippers were sprinkled with corn flour (Stasiszyn 2007b).

4. Plants' senses

Ancient civilisations believed that everything had a soul and that every being was holy (Kałużna-Ross 2007b; Stasiszyn 2007b). Can modern people admit that plants really feel, because they do not have such organs as animals, or that those organs are dispersed? Manusco and Viola are convinced that plants breathe without lungs, eat without mouths or stomachs, stand upright without a skeleton, and make decisions without brains (2017). In an article about individualisation of vascular plants, Baluška and Mancuso use an interesting phrase "specific chemical finger-prints" (2021). Though plants do not have "fingers", they leave their "chemical fingerprints" to communicate successfully with organisms under and above the ground.

A plant may be compared to a person who is blind, deaf, and mute at birth at the same time. A blind man has an incredible

sensitivity to all the sounds, a deaf man sees more, and a mute one can describe the world with his touch. Something similar may be happening with the plants. Their senses work differently than those of other living organisms, but they are somehow more sensitive to the stimuli from the environment. Manusco and Viola state that plants can not only absorb the light, but also use it and evaluate its quantity and quality (2017). The Aztecs “elevated” plants in their mythology. Two gods were trying to outdo one another in creating something remarkable. God Tecciztecatl had costly gifts: colourful feathers and precious stones and god Nanahuatl had only green stems of reed and agave thorns that made him bleed. In spite of his humble gifts, Nanahuatl jumped into the fire first, and that how the Sun emerged. Later, also Tecciztecatl made a huge leap, but there were only ashes left, and he created the Moon (Kałużna-Ross 2007a).

Even today, many tribes believe that plants see, though they have no eyes and also, they help people “to see” more. Because of certain species or groups of plants, people can cross the border of corporeality, and get out of their bodies, to see the unseen and invisible. A man being in contact with plants, may acquire another sense from them, not for every-day purposes and not available for all. The goddess Demeter was very often presented as a woman with poppy heads in her hands. Poppy was considered to be the plant of joy and opium was called “the tears of poppy”. Because of poppy seeds, one could experience the mystic power of nature. Not only the shaman could go to the realm of the dead, to see the ancestors – every man could do that, if he had the poppy seeds (Fiebag et al. 2003). The henbane (*Hyoscyamus niger*) contains psychotropic substances (hyoscyamine, atropine, scopolamine) in all of its parts and is strongly hallucinogenic. Famous Witches’ Flight might have been possible thanks to those plants. The aconitum (*Aconitum napellus*) that grew out of the Cerberus’ saliva had similar properties – its psychotropic substances made people

experience spiritual sensations (Fiebag et al. 2003). Ancient peoples believed that although plants could not walk with humans, they could make people “fly” and because they could “see” in a different way than humans, plants could make people “see” in another dimension of time and space. In South America, many plants were especially valued since they were very helpful in the process of attaining self-awareness and in contacting ghosts. The Jamestown weed (*Datura stramonium*) was used by the Amazonian Jivaro Indians – all the parts of the plant were poisonous for man and could cause coma, respiratory arrest and similarly to henbane, it gave people an opportunity to wander to other worlds (Fiebag et al. 2003). Of course, plants were not only used to help people to communicate with different zones, but also, they had paramedical application, since it was supposed to be easier and more efficient to cure a person in the state of intoxication (Fiebag et al. 2003). There was a plant chacruna (*Psychotria viridis*) called by the Inca “the liana of the souls” – thanks to indole alkaloids it enabled paramedical treatment.

Cacti were very interesting plants – only an initiated man such as shaman could take a small piece of them. He had to face his own fears and become like a god to cut the cactus. Those who watched the ritual of cutting the plant never called it “cutting” but rather “killing” the plant by shooting an arrow at it (Fiebag et al. 2003). Echinocacti (*Lophophora williamsii*) could be cut only by a shaman with a special sickle, so that some of the roots remained in the ground. Cacti were the gifts of gods, and that is why they could grow in the greatest heat, on a barren ground and dry lands, where other plants could not (Fiebag et al. 2003). In their stems, there were alkaloids like mescaline, which were used to make an alcoholic drink – peyote. After drinking it, people felt euphoric and weightlessness. Patients under the influence of mescaline could be cured because other areas of consciousness became opened; wise advice always came on time

and a person felt the power that made him feel healthy again. The presence of plants, or rather their integrity with the human body, could act as a lie detector. Climbers of such plants as *Ipomoea corymbosa* or *I. violacea* were called by the Maya “ololiuqui” which means “the seeds of truth”. When somebody lost something, he had to drink a decoction made of those plants and before going to sleep, which was like a hypnosis, the other person had to say into his ear a lot about the lost object. Albert Hofmann, PhD analysed such chemical compounds as amines of lysergol acid and elymoclavine, which may cause a similar effect one gets after LSD (Fiebag et al. 2003). The birds can fly because they have wings, and the plants make such substances that help people fly without wings – man’s perennial dream.

There is another plant worth mentioning – the one that became a goddess. The Inca people worshipped Mama Coca, even after Christian religion spread into the lands, the cult was still strong and she became as Virgin Mary to them. There is a story when Mary was running away with baby Jesus and Joseph to Egypt, and during that escape, she fell on the ground. Mary picked the coca leaf, chewed it and regained her strength. In Bolivia and Columbia people used 12 coca leaves (*Erythroxylon coca*) to predict the future. The plant itself showed the fortune teller the future, by shapes and colours of the leaves, threw out on the linen (Fiebag et al. 2003). That holy plant helped to survive hard climatic conditions and weariness, and also gave energy to work. There was a saying of the Inca people that it was the plant itself which decided about its qualities: those who treated the plant with respect, could get love instead of pain, food for the body and light for the mind, whereas the enemies of the Inca people and gold diggers would find in coca only suffering and madness (Skibicka 2007c).

Plants do not have ears, but they can hear with the whole surface of their bodies. They use the soil for it because the ground is a great carrier of sound waves; plants

detect vibrations using mechanoreceptors (Manusco and Viola 2017). It was already Darwin who had many interesting ideas concerning plants’ communication – he compared root systems of plants to man’s brain, showing that plants live “upside down”. Equally, smells are recognized by plants with their whole bodies, and this is how they get information about their environment, and can communicate with each other, or with insects, using biogenic compounds from the air (Manusco and Viola 2017). When one walks through a meadow or a forest after the rain, it is easy to smell how plants emit chemical particles through air and water – it is then, plants “talk” the most loudly! Analysing the sense of taste in plants, one may get the impression that their “taste buds” are the multiplicities of those of humans. It seems that plants are not satisfied with basic tastes: bitter, sweet, salty, or sour, they are few “steps ahead”, they recognise organic compounds, and use those, which are truly indispensable for their growth. Manusco and Viola notice that roots are able to detect microscopic amounts of minerals in a few cubic meters of soil, to find out all the “most delicious bits” – phosphates, nitrates and potassium (2017). Plants definitely feel and have the sense of touch. Mimosa (*Mimosa pudica*) or sweet pea (*Lathyrus odoratus*), twine around a stand or other support, and in a split second they curl like a spiral higher and higher towards the source of light (Manusco and Viola 2017). Plants are very sensitive, and they additionally have 15 more senses than humans: they can measure the amount of moisture in the soil and locate sources of water, even very far from their site, plants can also sense the gravity and electromagnetic field, and even chemical substances which are important or harmful to their growth (Manusco and Viola 2017). If one transfers this “plants’ sensitivity” to humans, it may be really something abstract and unbelievable, since man with such qualities could be healthier, if he was able to detect poisonous or carcinogenic compounds, or in the moment of the greatest

thirst, somewhere in the desert, he could just be able to find water. Persians considered plants as truly living organisms just like animals and men. First gods told them about the five types of fire. The third one called Urwaziszt was present in the whole world of vegetation – because of that fire, plants could sprout, grow and ripen (Juszczak 2008). Everything that still lives on earth came from seeds (Juszczak 2008).

As regards communication, scientists have proved that plants can communicate with each other and help one another, if there is a tree of the same species nearby, and they take away the needed substances and light from other species. Plants speak without mouths, “magically”, just like in the Slavic fairy-tale about the fern flower that grew only once a year, during the shortest night in June. An access to it was very hard, through dense forests and bogs; whoever was able to find the fern flower and somehow pick it up, became really rich, but he could not share his wealth with anyone. The mandrake root is a good example of a sound-making plant. The root of *Mandragora officinarum* resembles a posture of a man, so people in old cultures made statuettes, washed them in wine spirit, dressed them up and kept in special chests. The plant ripped out from the ground, yelled terribly and loudly, that is why there was always a dog tied to a mandrake root, so the animal could breathe all the poisonous vapours instead of man. Those terrible qualities of mandrakes were connected with their origins – they were supposed to grow under the gallows, first appeared from the semen of hangmen, and their voice was really the devil’s voice that lived in the plant (Fiebag et al. 2003). Columnar cacti like *Carnegiea gigantea* or *Pachycereus pecten-aborogium* known from thousands of years, served for rituals of cleansing, and after that, drinking hot decoction from the slices of a cactus. Because of a special mixture of alkaloids (3-methoxytyramine, 3,4-dimethoxyphenylamine, hallucinogenic mescaline), not only it was easier to contact with the other person, but also

the treatment enabled the patient to hear plants talk to him, so the cacti were some kind of mediators between the men and plants (Fiebag et al. 2003).

5. Plants and morality

If plants really live and feel, can they be good or bad, are they able to take sides in moral sense? In ancient cultures people believed that they could. On the one side, there was an old and mighty oak, the symbol of wisdom, manhood and all the manly virtues, and a birch, pure as souls of virgins; on the other, there were willows and alders which were supposed to have connections with werewolves and vampires, since they grew far away from people, on bogs and marshes leading to the underworld (Skibicka 2007b). Willows can grow in a very wet ground, muddy and hostile to other species of trees. People thought that it was something unnatural and creepy that a willow broomstick could sprout shoots as if it wanted to become a tree again (*Słowiański Bestiariusz*). An interpretation concerning parsley was also really interesting; this vegetable was growing so slowly because its root had to reach the realm of the devil and that took time (Bruce-Mitford 1997).

The counterweight to those evil powers were such trees as rowans that were chasing away the demons, lindens symbolising fertility and grace, as well as hazels (*Słowiański Bestiariusz*). The birch as a symbol of purity and womanhood had the abilities to cure even without tasting it. An ill person who suffered from shivers, had to go to the forest and shake 3 or 9 birches, so that the trees could also shake the body of the man, and chase away the disease (*Słowiański Bestiariusz*). Birchen broomsticks, opposite to the willow ones, could drive the evil spirits that got entangled in their twigs. It was important that such a broomstick could not stand in the corner of the house because when it fell down, the broomstick would cross with the doorstep of the house and bring death to its residents (*Słowiański Bestiariusz*). At the procession organized

in June during the Corpus Christi holiday, Christians took birches twigs home to save their home from evil powers. The cradle for a new-born baby had to be made from the birchen tree to chase away the spells and charms of unfriendly neighbours called “the evil eye” (*Słowiański Bestiariusz*). Similarly, the hawthorn had magical powers and protected from demons. Children who were prone to all kinds of diseases, were bathed in the decoction made from hawthorn. There were many rituals connected with the burial which were very important both for the dead person and for the community. People were afraid that after the ceremony, their dead relative could rise from the grave and harm the living. The hawthorn was somehow a “boundary bush” – it separated the world of the living from the realm of the dead, that is why, hawthorns were grown near the graves at the cemeteries. They were also growing near the graves of people who committed suicide and felons; under their tongues of those who were accused of raising as a vampire, the thorn from the bush was stuck (*Słowiański Bestiariusz*).

A very interesting example of a “boundary plant” is the mistletoe, a hemiparasite of trees. It does not sprout from the ground like other plants, but from a tree. In this way the mistletoe does not have the contact with the “down”, and yet, it does not reach the “up”. Mistletoe is evergreen, so people believed that it did not undergo the complete cycle of life, death and rebirth, and the time did not have the power over it (Fiebag et al. 2003). However, not every mistletoe was treated in a magical and ritualistic kind of way, it depended on the species of a tree it lived on. The most precious was the one from the sessile oak (*Quercus petraea*). Also, the way the mistletoe was cut, was very important. At the beginning, only Druids could touch the mistletoe and cut it with a golden sickle. Then, on the 6th day after the new moon, they covered it with a white coat and sacrificed an animal with it (Fiebag et al. 2003). Even nowadays, it is important to pick up the mistletoe in a special way

so that it could be used to decorate homes for Christmas. Firstly, the person has to be a man, secondly, the plant cannot be torn off, but only knocked with the head of the axe. Finally, and most importantly, the mistletoe has to be thrown carefully, and the person standing under the tree should catch it, so it can not touch the ground – otherwise, it would lose its magical powers (*Słowiański Bestiariusz*). Similarly to other plants, the mistletoe could do the so-called “sympathetic magic” which manifested in curing epilepsy – since this hemiparasite would never fall to the ground, so does the man who has faith in it (Fiebag et al. 2003). In Scandinavian mythology, the mistletoe had a very important role to play, and it has its own story. The goddess Frigg wanted to make his son Baldur immortal. It was the gods’ favourite boy, and that is why Frigg was wandering to the furthest corners of the world and asked every being and thing to promise that they would not harm her son. The whole world gave her that promise, apart from one, the mistletoe, which said that it had no benefits from such an oath. No one knew about it, but Loki, half-god, half-giant, a trickster, heard Frigg’s talk to the plant. In the meantime, the gods made a tournament and were throwing swords, spears and rocks at Baldur, since they knew he was immortal. Loki envied Baldur his youth and beauty, so he decided to get rid of the lad. He convinced Baldur’s brother Hóð, who also did not like him because Baldur was always in the centre of attention, to kill his brother by throwing a mistletoe’s twig at him. Hóð could not believe that such a small plant could kill Baldur, since he was watching how gods were playing with him and Baldur remained alive; yet Hóð did what Loki told him to do. When the mistletoe hit Baldur, the boy died (Skibicka 2007a).

When death first appeared on earth, people wanted to become immortal. They were constantly looking for a way not to die, but that secret was only available to gods, who knew how to prepare a nectar of immortality. In Persia, it was a juice from a heavenly plant

haoma (parahoma) called after the name of the god Haoma, the messenger between the worlds. The first man who could prepare that drink was Wanhant, and for it, his son Jima was born. The haoma juice was mixed with wolf's blood and it had to be drunk 4 times a day, through some kind of a filter of bull's hair (Juszczak 2008). The Chinese goddess Xiwangwu grew the peaches of immortality. The process of the growth of that fruit was very long, what helped to provide them with such specific qualities. They had been forming for 3000 years and for another 3000 years they were ripening. When they were already ripe, the goddess was making a feast during which she was serving sophisticated dishes with peaches: bear's paws, dragon's livers, monkey's lips, and phoenix' bone marrow (Kurek 2008a).

Human life would not continue without plants, and it is not only about the food, healing, or magical properties like those of beans from Oceania, which were so filling that a man needed to eat only once to be full for many days (Juszczak 2007b). Plants are food, shelter, medicine, relaxation; some of them sooth the senses, other motivate to act, and their colours and shapes fill people with awe. Yet, as representatives of modern civilisation, people have to look at ancestors from many countries, who treated plants with respect, and understood their dependence on plants in every step humans make. To conclude mythological references, let us quote one more story from Sweden which shows the integrity of nature as a whole. There was a queen who wanted to have children, so she went to an oracle to find help. The seer told the queen that within a year she would give birth to two sons, but there was one condition – the queen had to eat 2 fresh onions when she came back to the palace. The queen was so excited about the news that before the oracle had finished talking, she ran straight to the castle, and ate one onion without peeling it, and then another without shells. When boys were born, only one of them looked as a human being, the other

one was a dragon, since his mother did not listen to the end of the prophecy. Yet, there was a chance for a dragon prince to become a man – only a woman who would truly love him could change his shape. When the maiden who was destined to be prince's wife came, she had to take off her dresses one after another, whereas the dragon was throwing away one layer of his skin, just like the onion which is being peeled off. When the girl stood naked in front of the prince, the boy was no longer a dragon, but a beautiful young man, and they lived happily ever after (Shuker 2006).

Conclusion

Depending on how researchers understand the term “consciousness”, there are those who do not see any evidence for it in plants. Yet, the basic definition is enough to find the traces of it in the flora of the world. Consciousness means that someone is aware of the outside world, and plants definitely are. They are not only “aware”, but they also “react” to it all the time. For many researchers, reaction is not necessarily connected with decision-making and seems to be purely reactive and mechanical (Segundo-Ortin and Calvo 2021). If there is a strong connection between working memory and consciousness, in that case one should also add the ability to learn. If so, plants have to remember, in order to gather knowledge, what will be useful for them in future, and they really can do that (Gardiner 2012). At the beginning of the process, it may look like “guessing” what the world is like, but actually it is a constant monitoring of a given habitat, to predict what may happen, is it good enough to reproduce, can plants minimize the surprise, and feel safe in the environment (Segundo-Ortin and Calvo 2021). Plants can also learn how to react to pollinators they need for their reproduction. They have their original colour, shapes, and smells, but they also have to know how to keep a bee close, and to attract more insects. Scientists proved that plants could adjust the timing of their pollen presentation based

on previously experienced pollinator visitation intervals which is a truly amazing way to adapt (Segundo-Ortin and Calvo 2021). *Oenothera drummondii* flowers exposed to sounds in the same frequencies as those produced by flying bees, produce sweeter nectar, increasing the chances of cross-pollination. Plants are able not only to “hear” or “feel” the vibration caused by chewing caterpillars, but also learn when and how to react where the larvae are near (Segundo-Ortin and Calvo 2021).

Plants cannot change their place, they cannot run, since they lack the ability of locomotion. However, as Segundo-Ortin and Calvo noticed, locomotion is only one form of movement (2021). Plants can turn around, move up, their roots move in search of substances to grow (Segundo-Ortin and Calvo 2021). Non-locomotive organisms resort to different strategies to achieve their own ends, they have such specific kind of senses that “running away from” the enemy is not needed (Segundo-Ortin and Calvo 2021).

Finding food is a constant struggle of every organism, also for plants. They have to make a “decision” to find the right kind of food and the exact amount, and also how to store some, when the abundant days are over. The roots are also responsible for making a decision in search for substances needed. Roots can recognize the right concentration or level of minerals and compounds used for growth. Roots have evolved sensitivity to abnormal saline conditions, adapting their growth accordingly. This indicates that roots can sense ion gradients and make decisions that enable roots to stay away from high salt. (Segundo-Ortin and Calvo 2021). “Swarm intelligence” is an expression used in relation to animals, for example birds, but it seems to be also possible in the fauna. Plants “help” each other when they find the same species near, by “delivering” water and nutrition; opposite process takes place when there is a competitor nearby – kin recognition and competitive kin discrimination are the proves of aware decision-making in plants (Segundo-Ortin and Calvo 2021).

Modern technology proved to be useful to analyse such a difficult phenomenon as the existence of consciousness in plants, which is more or less similar to chasing ghosts with a camera. Time-lapse photography or electrophysiological techniques of observation are methods that can help to identify complex morphological and physiological responses (Segundo-Ortin and Calvo 2021).

The key to humans’ happy existence on earth, as in folk-tales, is to notice in a plant a living creature, and to treat it with respect, as ancient cultures did a long time ago. The authors of the article on the consciousness of plants give an example of more complicated cognitive processes going on in plants. If plants can be anaesthetised, put into a pharmacological coma, using drugs and then their living processes can be reversed, one may talk about plants that achieved a certain level of sensitivity, as it is attributed to animals (Trewavas et al. 2019). Fortunately, modern technologies give scientists specific tools to analyse such processes to admire plants even more. Seeing in flora its real beauty and meaning in humans’ lives, may help people to improve their living conditions and prolong the life on earth.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Conflicts of Interest: The author declares no conflict of interest.

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