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The Awe Box of Nature –Seeds

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The word "seed" carries several connotations. In simple terms, a seed in fundamental botany is an embryo or baby plant. Seeds are produced "naked" in one of the two divisions of the seed-bearing plants (for example, chilgozah) whereas seeds are encased in fruits in the other division. In agricultural science, the 1-seeded relatively tiny dry indehiscent fruits themselves are also referred to as seeds.

In the end, a giant banyan tree or any other massive plant (terrestrial, aquatic, or aerial) is the phenomenal manifestation of a single, typically microscopic seed. Related to how every meadow, woodland, or grassland is the consequence of the activity of many seeds. A remarkable story unfolds from seed to seed in terms of development, genetics, physiology, and biochemistry. Exploring the genesis, development, maturation, dissemination, lifespan, dormancy, viability, storage, testing, and germination of seeds is a lucrative field of study.

A taxonomic criterion of the species is the number of seed coats, which can range from one to three in development of seeds. Litchi, which is fleshy and edible, and nutmeg, the source of the vibrantly coloured and pricey spice mace, is two examples of the third seed coat, known as aril, which has significant economic significance.

Micropyles govern the passage of atmospheric moisture and gases into the seed through their valvular mechanism beneath the hilum on the surface of the seed. Interestingly, fire is a prerequisite for the shedding of seeds in certain tree species, such as the Australian bottlebrush, because of the chemical constituents of the successive layers of the seed coat that provide gradational protection for the embryo against the harsh physical and biological environment. Embryos are fed by the contents of the seed.

It is inaccurate to compare 2- and multi-seeded fruits as if they were peas in a pod, since each seed is a recombinant of their own genetic pool. Thousands of years ago, Arctic lupine (*Lupinusarticus*) seeds were discovered in Alaska caves and germination was achieved, and a flowering plant of *Silenestenophylla* was resurrected from 30,000-year-old

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fruit and seed material in northeastern Siberia. This indicates that seeds have long-lived genetic material (mRNA)!

It is fascinating to watch seeds being put to a variety of uses and abuses. They are found in different sizes, weights, pigmentations, surface architecture, micro sculpture, properties, and contents. A seed's size, weight, shape, colour, type, life expectancy, bicolourity, and multicolority are all curious and eye-catching. Our brain is drawn to seeds of every kind. Some of these aspects are illustrated and emphasized in the account below.

We cannot overemphasize the importance of seeds that are used in many crops as staple feed and food. In addition to pulses, cereals, millets and oil seeds, there are many other commodities. The seeds of orchids and certain species of total root parasites (e.g. *Cistanche*, *Orobanche*) are powdery, small, and light. Several hundred seeds can be mounted on a pinhead in orchid capsules, ranging from 6020 (in *Cephalantheragrandiflora*) to 3,7770,000 (in *Cynocheschlorochilon*). They are generally 470-560ì long and 80-129ì wide, and weigh between 6.3 and 0.3 mg; and are about the same size as spores of nonflowering plants.

It is very interesting that the initial carat weights of the jewellers in the Mediterranean region are supposed to have been the seeds of the carob tree (a member of the pea family), and that the goldsmiths in India used *rati*seeds as weights (on average, a *rati*seed weighs 105 mg). Speaking of weights, a double coconut seed (*Lodoicea* sp.) is the heaviest and biggest seed in fact, weighing $2x10^{4}$gm compared to the orchid seed, *Hoodyerarepens*, which weighs $2x10^{-6}$ gm. The embryo in situ is, incidentally, the smallest in double coconuts and the largest in avocados relative to the size of the seed.

Tick seed (*Coreopsis* sp.), flea seed (*Plantagopsyllium*), poison button (*Strychnosnux-vomica*), and ivory nut (*Phytelaphasmacrocarpa*) are examples of common or trade names for seeds that serve as a useful reminder of one or more characteristics of the seed species. In the seed world, flea seeds (*psyllium*) resembled fleas, which are tiny, wingless insects. The moniker "poison button" references to the main use of nux-vomica seed.

Seeds are used in a multitude of ways; a few examples of each kind would suffice to illustrate how versatile they are. Too many applications exist for tung oil and candlenut (*Aleurites* spp.) seed oil to be included here. Jojoba seeds (*Simmondsiacalifornica*) produce a liquid wax that is highly valuable for industry. Bixin is a significant vegetable colour used in the dairy and food sectors. It is the main component of the pigment that surrounds annatto

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seeds (*Bixa* sp.). Ivory nuts or vegetable ivory palms of South America are used as substitutes for ivory in billiard balls, dice, and tourist souvenirs. Their mature endosperm (primarily hemicellulose) is as hard and colourless as ivory.*Entadaphaseoloides* (Nicker bean) orbicular flat seeds are so enormous that they may be easily used to crimp linen. It is unnecessary to emphasise the significance of the tough tubercled nuts of *Elaeocarpussphaericus* (rudraaksha) in the context of India; religious seeds or *Gauzumaulmifolia*seeds used as rosaries (prayer beads) are thought to be a substitute for rudraaksha. Rosaries, bracelets, and necklaces are created from the seeds of both species.

Additionally, seeds are aesthetically pleasing; coloured seeds are frequently used as ornaments. A few unique (and pricey) indoor decorative items include large quantities of Molucca beans (*Caesalpinia crista*), the bicolored seeds of Indian liquorice, the shining scarlet seeds of the bead tree (*Adenantherapavonina*), the bright red seeds of *Erythrina* species, and the bicolored seeds of Indian liquorice.

Seed germination as phenomena teaches us a valuable lesson about surviving! The pippal (*Ficusreligiosa*) seed, in particular, is one of the tiny seeds of the Moraceae family that sprouts even in unlikely places like the gap between two RCC slabs and at the joints along drainage pipes; all that the pippal seed needs is a pinch of soil and moisture; this is a true example of survival of the fittest. The progressive burrowing by the wet graminaceousawned seed of the *Aristida* species required for germination is equally astounding.

How about the germination of seeds from plants that are hidden or inaccessible, seeds from Orobanche, and seeds from certain other genera in which the embryo in situ is only a meristem ball that has not yet differentiated into embryonic organs? What lessons can we learn from the growth of such seeds?

Among the most common misuses of seeds include their use in bioterrorism, food and product adulteration, and criminal activity. Indian licorice, also known as rati (*Abrusprecatorius*), and nux-vomica seeds are both employed in assassination and as cow poison. Nux-vomica has been implicated in suicides, killings, accidents and animal poisoning. Nux-vomica seeds, which contain the alkaloids strychnine and brucine, are next to aconite in terms of their ability to cause murders. One of the most lethal spinal poisons, strychnine is effective at doses as low as 1 part in 400,000. In addition, the Poisons Act of 1919 restricts the sale of vermin killers and rat powders in India. Strychnine is the primary

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component in a number of widely accessible vermin killers and rat powders, including Barber's, Butler's, and Bunder's powders.

It's interesting that certain *Strychnos*species are completely safe. For instance, *S. potatorum* seeds, also known as clearing nuts or nirmali, are used to clean muddy water that has been kept; the seeds are rubbed against the interior of the storage container to assist the muddy water precipitate the dirt and clear it (The paste of nirmali fruits is said to bind most heavy metals and thus serves as an antipollutant).

Indian liquorice seeds contain abrin, a very potent thermolabiletoxalbumin. Both abrin and snake venom have blood poisoning effects and coagulate red blood cells. With a tiny amount of alcohol, the crushed Indian liquorice seeds are turned into a paste and then formed into spikes or suis that are dried out in the sun, either by themselves or in combination with datura, opium, or onion. The hardened suis are inserted into a wooden (bamboo) handle and driven deeply into the tongue or skin of the target animal.

Datura and Calabar bean are two seeds that are occasionally used for illegal purposes. It is known that ingesting as little as five datura seeds by a youngster can lead to serious health risks such encephalitis, meningitis, epileptic delirium, and uraemia; an average adult has to consume roughly 20 datura seeds to experience the negative consequences. The very lethal mature Calabar beans (of the pea family) are used by the locals of West Africa as a test poison in cases of suspected witchcraft; therefore, the Calabar bean's popular label, "ordeal bean." The bean's cotyledons contain the deadly chemical physostigmine. (Incidentally, the only medication available today for the severe muscle disorder myasthenia gravis is physostigmine.) According to general belief, when Calabar beans are consumed orally, the innocent will throw up the beans while the guilty would hold onto them and perish from their deadly effects.

Among the adulterants of black pepper, roasted coffee beans, and mustard are seeds from the papaya, tamarind, and Mexican poppies. Black pepper is a ruse to disguise the processed papaya seeds. Tamarind seeds that have been roasted and ground are frequently added to coffee powder to make it taste better. Coffee beans can also be replaced with carob tree seeds. It is alleged that the roasted seeds of *Diplosporasphaerocarpa*, a member of the coffee family, have the same aroma as pure coffee, look like pure coffee powder, and contain

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a substance similar to caffeine. As a result, the roasted seeds of *D. sphaerocarpa* are used to successfully adulterate the real coffee beans.

Artificially coloured foreign seeds that resemble cumin and opium poppy seeds in appearance are frequently employed as adulterants in food products. Sage plant seeds have an abundance of mucilage, which is why they are used to adulterate psyllium seeds. Sago palm nuts are used as an alternative to area nuts.

The employment of certain biological agents as bioweapons, such as the seed protein ricin, is known as bioterrorism (BWs). The deadly dose of ricin for an adult weighing 60 kg is around 6 mg, however for a youngster; just 1 or 2 castor beans may be fatal. A right-wing "Patriot" movement in Minnesota acquired castor bean ricin in 1991 and planned to use it to target the revenue servicers and local law enforcement by putting it on the skin with aloe vera and dimethyl sulfoxide or as dry aerosol.

Plant biotechnologists have recently created synthetic seeds as well as GM (genetically modified) seeds. The human-made artificial seeds comprise an embryoid, a shoot tip, or other "germinable" unit developed in vitro and enclosed in a gel that favours "germination," in contrast to the genetically modified seeds with the built-in terminator gene programme that may not germinate. Artificial seeds don't diminish the wonder of genuine seeds; on the contrary, they emphasise a seed's most basic meaning.

So there are seeds with amazing qualities. It would be a visual feast to even catch a whiff of a seed museum; to promote seed gathering would undoubtedly pique curiosity!