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# Seed dormancy its alleviation and importance in agriculture

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**Abstract**
Many seeds do not germinate when placed under conducive conditions for germination viz., optimum temperature, moisture, oxygen. However, seeds can be shown to be viable, as they can be induced to germinate by various special artificial treatments, or under special external conditions. Such seeds are said to be dormant, or to be said in a state of dormancy. Plants with a long history of domestication generally show less dormancy than wild or recently domesticated species. When domesticated species exhibit dormancy, they become a problem to the communities involved in seed occupation. However, a degree of dormancy in certain crops is desirable since it prevents pre-harvest germination and helps in the maintaining seed quality. Though, dormancy may be cause seeds of numerous species to maintaining ungerminated in the soil for many years. This explains the presence of unwanted crop plants or weeds in fields that are cultivated regularly and maintain seed quality. Nevertheless, dormancy may cause seeds of numerous species to remain ungerminated in the soil for many years. This explains the presence of unwanted crop plants or weeds in field that are cultivated regularly.

**Keywords:** Seed dormancy, agriculture, artificial treatments

## Introduction
Seed may require proper base/substratum for their germination, when we provide all essentials viz., adequate water, temperature and air; without the proper base, seeds may be not germinated. Therefore, proper base/substratum should be included under the essentiality for germination and dormancy in seed may be also due to lacking of proper base/substratum. According to Wareing (1965) the term dormancy will be used in the sense where the viable seed of a given species falls to germinate under conditions of moisture, temperature and oxygen supply which are normally favorable for the later stages of germination and growth of that species.A common misconception of seed dormancy is that it is merely a resting state in the absence of suitable germination condition. This state is often called Quiescence. However, true dormancy is defined as a state in which seeds are prevented from germinating even under environmental conditions normally favorable for germination.

## Its Type
**1. Primary dormancy:** May occurs due to chemicals/ anatomical features of seed.
Primary dormancy prevents germination on the mother plant and usually also for some time after shedding and harvesting. Two types of primary dormancy;

1. Exogenous/Enforced/relative dormancy: it is a condition in which the essential germination components viz., water, light andtemperature) are not available to seed and thus fails to germinate. This types of dormancy are generally related to physical properties of seed coat.
2. Endogenous dormancy /Innate/ True Dormancy: It is the most prevalent dormancy found in seeds and is due to inherent properties of seeds The seed may possess some excess inhibitors that must be removed or reduced prior to germination. The physiological changes such as rudimentary embryo maturation, response to growth regulators, changes in temperature, exposure to light etc., will relieve endogenous dormancy in seed.

**2. Secondary dormancy:** May occurs due to unfavourable environmental conditions.
*eg.:* Exposure of dry barley seed to temperature of 50-90 $^0$C
Seven days' storage of winter barley at high moisture content at 20 $^0$C
Nikolaeva (1977) classified dormancy into three broad class are as below;

I. **Exogenous Dormancy**: Dormancy is due to some features of the seed located outside the embryo

a. Impermeability of seed coat to water: due to seed coat structure, which is hard enough to restrict the entry of moisture into the seeds, thereby preventing seed germination. *eg.*Malvaceae, Fabaceae, Alliacea

b. Impermeability of seed coat to gases; is related to the insufficient intake of oxygen by seeds due to impermeability of seed structure enclosing embryo. *eg.*Poaceae, fruit crops & forest trees

c. Mechanical resistances of seed coat: growth of embryo is checked due to extremely hard seed/fruit structure such as seed coat, endosperm per carp etc., *eg.* Acacia species.

d. Inhibitors present in seed coat/endosperm: biochemical substances present in seed coat or endosperm block the germination of embryo.

Ex: Iris app- inhibitors present in the endosperm
Barley- Aflotoxin
Squash-Dichlobenil
Tomato-Feruline, Caffeie acid, Lycopene
All spp.- Coumarin

**II. Endogenous dormancy: the** reason for dormancy is present within the embryo

a. Incomplete embryo development: due to an incomplete development of the embryo. In such cases, germination does not occur until the embryos develop to their normal size. Ex: Palmaceae, Amgnoliaceae

b. Inhibitors present within the embryo: Dormancy arises from metabolic blocks produced by biochemical substances called inhibitors present within the embryo. In such cases germination can commence only when these inhibitors are leached out of the embryo eg: Xanthium, Fraximus

**III.** Combined Dormancy: dormancy is produced by a combination of two or more factors which act in complementary fashion.
eg.: Fraximus

**Methods of breaking dormancy**

**I. Natural breaking of dormancy:** in nature dormancy terminates when embryo gets suitable environment such as adequate moisture, aeration and temperature. The impermeable seed coat present in many species became permeable due to the rupturing of softening action of natural agents like microorganism, high or low temperature, humidity fiber and abrasion due to wind or digestive tracts of birds and animals which feed on these seeds. *eg*: Rhizoctonia damages seed coat

**II. Treatments to break Dormancy:** the various treatments for overcoming dormancy may be divided into the following three groups

1. Seed coat treatments: These treatments aim at making hard seed coat permeable to water or gases either cracking or softening them. The process is usually referred as scarification. These treatments are either physical or chemical in nature.

**a. Scarification**

**i. Acid scarification:** treating seeds with concentrated acids like sulphuric acid, Hydrochloric acid etc,

**ii. Thermal scarification:** the seeds are treated with different temperatures and gases

**iii. Mechanical scarification:** The seed coat is damaged using mechanical means. Viz.,

- rubbing seeds on sand paper or by using mechanical scarifier as in subabul
- Making small incision by piercing a needle as in bittergourd
- Removing of entire seed coat as in rubber

**2. Embryo treatments**

**1. Stratification:** the incubation of seeds at a suitable low temperature (Usually 0-50C) over a moist substratum before transferring them to a temperature optimum for germination. Ex. Cherry (Prunuscerasus), Mustard and rape seeds

**2. High temperature treatment:** in some species, incubation at 40-500C for few hours to 1-5 days may be effective in overcoming dormancy. Ex. Rice seeds more than 15% seed moisture treated in hot water of 400C for 4-5 hours.

**3. Chemical treatments:** alternatively, growth regulators or other chemicals may be applied to induced germination growth regulators commonly used GA3 (100ppm), kinetin (10-15ppm) and thio-urea (0.5-3%)

**3. Miscellaneous approaches:**

i. Exposing seeds to light
ii. Pressure treatment
iii. Infra-red radiation treatment
iv. Magnetic treatment

**Significance of dormancy in Agriculture**

**Advantages**

1. Storage of seeds is prolonged, it is a survival mechanism
2. Seed can pass through adverse situation /conditions and it restrict germination in adverse sowing conditions such as heavy frost, dry weather or excessive moisture.

Impermeable seeds maintain seed quality under dverse conditions of harvest and storage, eg. Cotton.

3. Prevents the in situ germination and helps in maintaining seed quality. i.e., vivipary

**Disadvantages**

1. No uniform germination and create problem in sowing/ planting schedule.
2. Dormancy may cause seeds of numerous species to remain ungerminated in to the soil for many years, to appear as unwanted to later crops, even after years of intensive cultivation.
3. Difficult to maintain plant population.
4. Interferes in seed testing procedure

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