

# EXTRACTION CHARACTERIZATION AND EVALUATION OF *PRUNUS DOEMSTICA* SEED-AS AN EXCIPIENT

A REVIEW

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## ABSTRACT

Binders are pharmaceutical excipients that are commonly employed to impact cohesiveness to the granules. This ensure the tablet remain intact after compression. The development of new excipients for potential use as a binding agent in tablet formulation continues to be of interest. In recent years, plant derived polymers have evolved tremendous interest due to their diverse pharmaceutical application such as binders, diluents, disintegrates in tablets. Natural polymers are biocompatible, cheap and easily available and are preferable than semi synthetic and synthetic excipients because of their lack of toxicity, low cost, availability and non irritant nature. To evaluate binding potential of *prunus domestica* seed powder in tablet formulations. *Prunus domestica* seed powder as binder and also compared to the other binding agents.

**Uniterms:** Excipients, Binding agents, Natural polymers, *Prunus domestica*

## INTRODUCTION :

One of the most important stone fruits crops of the world is plum fruit. These also include several familiar stone fruits like apricot , cherry and peach. Fresh plum fruits are traditionally processed into products with longer shelf life such as prunus ( dried plums ) . There are more than 2000 different varieties of plums among which relatively few more of commercial importance. Plums are fruits best adapted to moderate climate , but they are widely grown all throughout the world , from the cold climate of Siberia to the sub-tropical conditions of the Mediterranean region china , Romania and U.S.A are leading countries for the production of plum fruits .

The plum is a drupe fruit which belongs to the subgenus prunus ( family Rosaceae ) in the subgenus Prunophora and includes several species of prunus and the most commonly grown species are grouped into two main categories are *Prunus domestica* L.,( The European plum ) this is one of the main species grown whole world wide. The fruit was introduced into the U.S.A in the 17th century by pilgrims in the USA prunus domestica is used for preparation of fruit cocktails and rarely eaten fresh. Another one is *Prunus salicina* Lindl. (the japanese plum ), is considered to have originated in china. Although a native of china, the common name japanese plum is used because the first imports of this fruit tree to the USA were from Japan. Japanese plum production is larger than that of European plum production.

## HISTORICAL BACKGROUND

In the world plums are produced about 10.1 million tonnes in 2005. Approximately , half of the world production in received from china that is producing about 4.2 million tonnes. this amount was about two hundred thousand

tonnes in turkey. Production amount is increasing rapidly in turkey because of its suitable climate for the new plum cultivars in last year's. With many know varieties of plums it is not surprising that it has different heritages and places of origin in all over the world. The practice of cultivation has been done since prehistoric times, longer perhaps than any other kind of fruit except the apple . Earliest known data of plums says that plums are origin of china,470BC. The European plums are thought to have been discovered around two thousand years ago, originating in the area near the eastern europe or western asia. In ancient roman times, 300 varieties of European plums were mentioned. The pilgrims introduced the European plums to united states in 17th century. Today plum is cultivated in all temperature climate countries of the world. Europe first bred European plum (*prunus domestica*), America first had the American plum (*prunus Americana*), south asia cultivated the cherry plum (*prunus cerasifera*), and western asia is having the damson plum (*prunussalisina*).

### Characteristics of plums

Plums are a drupe fruit of the subgenus *prunus* of the genus *prunus*. Plum fruits are 2000 species in genus *prunus*. They come in a wide variety of size and yellow colors. European plums are generally oval, smaller and more variable in color and japanese plums are larger rounded shaped. Mature plum fruit may have a dusty-white coating that gives them a glaucous appearance, and it is easily rubbed off. Dried plum fruits are called dried plums or prunus, although prunus are a distinct type of plum , and may have antedated the fruits are commonly known as plums.

### Scientific classification of *Prunus domestica*



kingdom: Plantae

Super division: Spermatophyta

Class: Magnoliopsida

Order : Rosales

Family : Rosaceae

Genus: *Prunus*

Subgenus: *Prunus*

Species: *Prunus domestica L.*

**Root:** Deep-rooting-shallow-rooting with stolons.

**Bark :** The bark is pale-reddish and slightly cracked.

**Leaf:** The leaves are ovate, the upper surface is smooth and dark green. The underside is lighter and slightly hairy. The leaf margin is serrated and the leaf arrangement is alternate.

**Flowers :**

Flowers are white , smaller and have longer pedicles. And these flowers are borne mostly in umbel- like clusters of 2-3 individuals on short spurs , and solitary o 2-3 axis of 1 yr old wood. European plums bloom much later than japanese types, and are therefore less frost prone. the flowers in groups of one to five together on short stemma, and the fruit having a groove running, down one side and a smooth stone.

**Fruit characteristics of *Prunus domestica* cultivars**

*Prunus domestica* cultivars differ in many fruit quality traits. eg .,weight and size, firmness, color, flavour and the content of health-enhancing components like phenols etc..

Fruit features	Bluefre	Sweet common prune	President
Time of fruit ripin	Mid September	Mid September-End of October	Beginning of October-End of October
Shape of fruit	Spherical	Elliptical	Oval
Size of fruit	Large	Middle	Large and very large

**Seeds:**

The seeds are light brown in color and vary in sizes and shape. They contain maintain the genetic uniformity of the plant, are easy for seed storage, and are free. These seed oils can be used in the cosmetic industry.

**Nutrient and phytochemical content**

Nutrients present in plum determine nutritive value and taste of plums. Plums have abundance of bioactive compounds such as phenolic acids , anthocyanins , carotenoids, minerals and pectins. Plums constitute a valuable component of our diet, both in terms of their nutritive and dietary value. these fruits are becoming an increasing popular object of nutritional studies conducted on humans and animals, assessing the effect of plum consumption on the functioning of the organism. For many decades plums have been used in indian medicine as a component of natural drugs used in case of leucorrhea, irregular menstruation and miscarriage. Plums have low calorie content and relatively high nutritive value. They contain carbohydrates , first of all sucrose, glucose and fructose , organic acids,e.g., citric and malic acids, fibre, tannins, aromatic substances and enzymes. Contents of minerals in plums increase as fruits ripen. These substances determine nutritive value and taste of plums.

Plum fruit contains the high level of phenolic compounds including flavonoids and particularly the subclass o anthocyanins observed in the plum.

Nutritional composition of European plum fruit per 100gms weight

Component	Fresh plums	Dried plums
Moisture(g)	87.23	30.92
Energy(kJ)	192	1006
Carbohydrate(g)	11.42	63.88
Fat(g)	0.28	0.38

Protein(g)	0.70	2.18
Sugars, total		
Glucose(g)	5.07	25.46
Fructose(g)	3.07	12.45
Sucrose(g)	1.54	0.15
Total dietary fibre	1.4	7.1
Minerals		
Calcium(mg)	6	43
Iron(mg)	0.17	0.93
Magnesium(mg)	7	41
Phosphorus(mg)	16	69
Sodium(mg)	0	2
Zinc(mg)	0.10	0.44
Copper(mg)	0.057	0.281
Vitamins		
Ascorbic acid (mg)(c)	9.5	0.6
Thiamine(mg)(b1)	0.028	0.051
Riboflavin(mg)(b2)	0.026	0.186
Niacin(mg)(b3)	0.417	1.882
Pantothenic acid(mg)(b5)	0.135	0.422
Pyridoxine(mg)(b6)	0.029	0.205
VitaminA( $\mu$ g)	17	39
Vitamin E(mg)	0.26	0.43
Vitamin k1( $\mu$ g)	6.4	59.5

### Phenolic content of plums

Phenolic compounds are fascinating and unique class of bioactive compounds widely spread throughout nature . Because of their richness in health promoting components and preventing of the occurrence of several diseases as well as their excellent nutrients content, there has been great interest in ascertaining the total antioxidant capacities and total phenolic content numerous studies confirmed the health-promoting action of plums as a dietary component.

Phenolic compounds	Fresh plum	Dried plum
Total (mg)	111	184
Neochlorogenic acid(mg)	81	131
Chlorogenic acid(mg)	14.4	44
Anthocyanins(mg)	7.6	-
Catechind(mg)	5.4	-

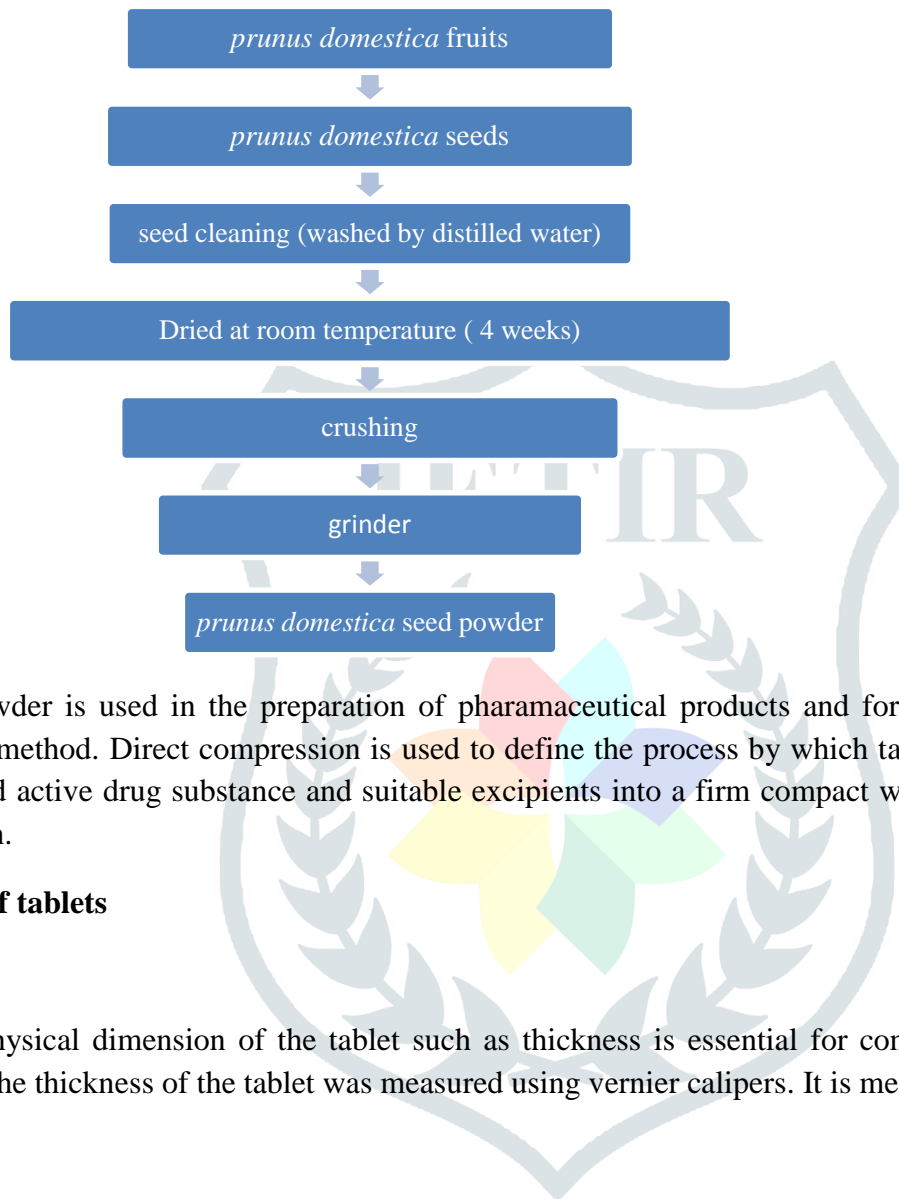
## MATERIALS AND METHADODOLOGY

### Extraction of seed

*Prunus domestica* fruits were collected. Remove the dirt portion and washed with water. Extraction of the seed from the fruit with the help of knife, seeds were evolved.

## Collection of *prunus domestica* seed powder

Seeds were collected, and washed with deionized water or distilled water, then go to the drying procedure the seeds were dried at the room temperature at 4 weeks. Seeds were crushed with the help of crusher. The final procedure is crushed materials are poured into the grinder, fine seed powder is formed.



The seed powder is used in the preparation of pharmaceutical products and formulation of tablets by direct compression method. Direct compression is used to define the process by which tablets are compressed directly from powdered active drug substance and suitable excipients into a firm compact without employing the process of granulation.

### Evaluation of tablets

#### Thickness

Control of physical dimension of the tablet such as thickness is essential for consumer acceptance and tablet uniformity. The thickness of the tablet was measured using vernier calipers. It is measured in mm.

#### Hardness

The tablet hardness was determined by Monsanto hardness tester. It is an important parameter that prevents breakage of tablets during storage, transportation, and handling. The tablet was fitted lengthwise between plunger and force applied. Noted down the pressure at which tablet was crushed. The average hardness of 3 tablets was recorded in terms of  $\text{kg}/\text{cm}^2$

#### Weight variation

According to IP weight variation test can be performed by randomly selecting 20 tablets. From each batch and weight them individually. Now the average weight of these 20 tablets was calculated and compare to the individual weight of each tablet. The tablet pass the weight variation test if not more than 2 tablets are outside the percentage limit and no tablets differ by more than 2 times the percentage limit.

S.NO.	Average weight of the tablet (mg)	Maximum % difference allowed
1	130 or less	10
2	130-324	7.5
3	324<	5

### Friability

It is calculated by Roche friability apparatus. Resistance to shock and abrasion is defined as friability. To perform this test 10 tablets were selected randomly, and their initial weight was noted. Now these tablets were passed into Roche friabilator and rotated at a speed of 25rpm till 100 revolutions. The tablets were removed from the friabilator dusted off and weight again.

$$\% \text{Friability} = \frac{\text{Initial weight of the tablets} - \text{Final weight of the tablets}}{\text{Initial weight of the tablets}} \times 100$$

### Wetting time

Wetting time is an important parameter to evaluate the effect of different excipients in the disintegration of the tablet. A simple procedure is used to determine the wetting time of the tablets. A piece of tissue paper folded twice of 10cm diameter was placed on the petri plate containing 6ml pH 6.8 phosphate buffer and add one millilitre of water containing amaranth (water soluble dye), a tablet was put on the paper, and the time for complete wetting was measured. Three trials for each batch were performed and the standard deviation was also determined.

### In-vitro disintegration time

Disintegration time test was carried out according to USP specifications. 6 tablets were placed in a disintegration tester filled with distilled water at  $37 \pm 0.20^\circ\text{C}$ . The tablets were considered completely disintegrated when all the particles passed through the wire mesh. Disintegration times recorder and mean of two determinations.

### Dissolution studies

In vitro drug release studies of all the formulations were carried out using USP type- II tablet dissolution test apparatus as per IP. For in vitro dissolution studies simulated 0.1N HCL, 6.8 pH buffer mediums are used. The temperature was maintained at  $37 \pm 2^\circ\text{C}$  using rotation speed 50 rpm. The medium used was HCL buffer for first 2 hours and later the buffer was replaced by phosphate buffer. At every half an hour interval 5ml aliquots were collected and then it was replaced by fresh buffer media to maintain sink conditions, it is extended to 6 hours. The samples were diluted with 5ml of buffer and filtered using whattsman filter paper, the samples were checked for absorbance in UV spectrophotometer.

### Health benefits of *prunus domestica*

#### Improves vision :

Plums are a rich source of vitamins, especially vitamin A is improves for health... eyes and sharp vision.

**Relieves constipation and may help boost digestion :**

Plums are a good source of dietary fibre it relieves constipation, as well as plums contains the sorbital and isatin like components that help in regulating the digestive system and these components also have a laxative effect that encourage the secretion of fluids in the bowels and promote efficient flushing of waste. dried plum or prune is said to be one of the best remedies to treat constipation .

**Improves blood circulation :**

plums contain vitamin k and potassium that have the ability to absorb iron in the body . these fruits contain sufficient iron copper assists in the formation of red blood cells , further helping in the purification of blood and a healthy blood.

**Healthy bones :**

Eating plums can boost the bone health because it contains the vitamin K, dried prunus are rich in minerals like boron, copper, magnesium, and manganese which helps in maintaining the calcium balance of the body.

**Brain development :**

prunus are good for proper development of the brain as it contains many memory enhancing compounds like neocholinergic acid, cholinergic acid , caffeic cid, flabomols, and flavonoids. prunus are also useful as a supportive adjuvant in the treatment of impaired memory function .

**Healthy skin :**

the vitamin c present in plums along with other antioxidants help keep the skin radiant, youthful and glowing these are many studies that have linked higher vitamin c content with lowered risk of developing fine lines and wrinkles on the skin.

**Fights cancer cells :**

Plums are useful for the prevention of cancer especially Brest cancer and lung cancer.

**Conclusion**

In summary, a review has identified an emerging system of evidence that demonstrates the beneficial health effects of edible plums. Plums have a wide range of nutritional medical uses and are effective in the treatment and prevention of hypercholesterolemia and osteoporosis. In pharamaceutical industry *Prunus domestica* plant gum used as binder in tablet formulations. Nutritional composition of plums and prunus and the effects of processing on their bioactivity is also important for future research.

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