



**PHYTOCHEMICAL ANALYSIS OF DRAGON FRUIT SPECIES  
(*SELENICEREUS COSTARICENSIS*, *SELENICEREUS PURPUSII* AND  
*SELENICEREUS UNDATES*)**

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Article Received on 31 Jan. 2026,  
Article Revised on 21 Feb. 2026,  
Article Published on 01 March 2026,

<https://doi.org/10.5281/zenodo.18811634>

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**How To Cite This Article:** \*V. Venkateshgoud<sup>1\*</sup>, Dr. S. Karnakar Reddy<sup>2</sup>, P. Srinivasulu<sup>3</sup>, K. Goverdhan<sup>4</sup>, A. Shivakumar<sup>5</sup>. (2026). Phytochemical Analysis of Dragon Fruit Species (*Selenicereus Costaricensis*, *Selenicereus Purpusii* and *Selenicereus Undates*) World Journal of Pharmacy and Pharmaceutical Sciences, 15(3), 843–854.

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**ABSTRACT**

This study reveals the phytochemicals extracted by ethanolic solvent from this fruit pulp. The phytochemicals analysis was carried out in this fruit pulp collected from three different regions of the farmers' fields. These extracts, after treatment with relevant reagents and chemicals, resulted in the ratio of specific phytochemicals.

**KEYWORDS:** Steroids, Alkaloids, Tannins, Flavonoids and Glycosides.

**INTRODUCTION**

Dragon fruit, also known as pitaya or *Selenicereus*, a climbing cactus, is a tropical fruit that is native to Central America but is now cultivated in various regions of the world. The

*Salanicereus costaricensis* plant has long, vining, and succulent-like stems that can grow up to several meters in length (Balendres, Bengoa, 2019).<sup>[6]</sup> These stems have aerial roots and require support, such as a trellis or a sturdy structure, to climb and grow (Pushpakumara et al. 2005).<sup>[7]</sup> Dragon fruit can be propagated through seeds, but it is more commonly done through stem cuttings. The cuttings are rooted in a well-draining potting mix and kept in a warm, humid environment until roots develop. Dragon fruit plants can be propagated through

stem cuttings. The cuttings are usually around 20-30 cm long and must be allowed to dry and callous before planting. Once rooted, the cuttings can be planted in well-draining soil or a potting mix (ELO beidy, 2006).

## MATERIALS AND METHODS

Collection of Plant material Fresh and Healthy population of Dragon fruits varieties was collected in the month of July, from Different farmers' fields in Telangana regions. The plant material was identified and authenticated by Department of Botany Osmania university Hyderabad, Telangana.

Preparation of Extracts (*Selenicereus costaricensis*).

The fruit was collected, thoroughly washed and peeled to obtain the pulp. The pulp was juiced without adding water. Phytochemicals were extracted from the juice by maceration it with ethanol for 24 hours. After maceration, the ethanol extract was separated using a separating funnel. Due to the presence of colour (red) in the ethanol extracts, it was unsuitable for phytochemical testing. To remove the colour, the extract underwent activated charcoal treatment with heat application. Following decolorization, the ethanol extract was filtered to prepare it for subsequent phytochemical tests.



**Fig. 23: Collection and processing of fruit material.**

### Phytochemicals tests

#### Test for Carbohydrates

Molish test: Take 2-3 ml of sample, add a few drops of  $\alpha$ -naphthol solution and shake well. Then listen carefully. Add sulfuric acid from both sides of the test tube and observe the formation of a pink ring where the two liquids meet.

**Tests for Protein**

Biuret test: Add biuret reagent to 3 ml of sample. Visible red color formation indicates the presence of protein.

Xanthoprotein test: 3ml extract 1ml concentration. Add H<sub>2</sub>SO<sub>4</sub>. The formation of a white precipitate was analysed for the presence of protein.

**Tests for Amino acids**

Ninhydrin test (General test): Take 3 ml of extract and 3 drops of 5% ninhydrin solution and heat in a boiling water bath for 10 minutes. Blood or blue symptoms appear.

**Tests for Alkaloids**

Test solution was dissolved in dil. HCl, shake and filter.

Wagner's test: Add a few drops of Wagner reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

Hager's test: Add a few drops of Hager's reagent to 2-3 mL of filtered water. The formation of a yellow-colored precipitate was observed due to the presence of alkaloids.

Mayer's test: Add a few drops of Mayer's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

Dragendorff's test: Add a few drops of Dragendorff's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

**Tests for Glycosides**

Kellar Kiliani test: Add 2 ml of glacial acetic acid and 1 drop of ferric chloride and concentrated sulfuric acid to 2 ml of sample. The presence of glycosides forming a red-brown color was found at the junction of the two liquid layers, and the upper layer was blue-green.

**Tests for Saponins**

**Foam test:** The drug extract or dry powder was shaken with water and observe the formation of persistent foam.

### Tests for Tannins and Phenolic Compounds

Ferric chloride test: Add few drops of 5% FeCl<sub>3</sub> solution, formation of bluish black color indicates the presence of phenols.

Lead acetate test: Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

Potassium dichromate test: Add few drops of 10% potassium dichromate, formation of red precipitate indicates the presence of phenols.

Acetic acid test: To 2-3 ml of sample and few drops of acetic acid solution were added. Formation of red color solution was observed.

### Tests for Flavonoids

Lead acetate test: Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

Shinoda test (Magnesium hydrochloride reduction test): Add some broken magnesium strips and concentrate for 2-3ml test sample. With slight heating, hydrochloric acid was added dropwise. Colour development from red to red is observed due to the presence of flavonoids.

### Preparation of Extracts (*Selenicereus purpusii*)

The collected fruit was thoroughly washed and peeled to obtain the pulp, which was then juiced. Phytochemicals were extracted from the juice by macerating it with chloroform for 24 hours. After maceration, the chloroform extract was separated using a separating funnel and subsequently filtered. The filtered chloroform extract was then subjected to distillation to obtain a concentrated extract.





**Fig. 24: Colletion and processing of fruit material.**

### **Phytochemical Tests**

#### **Test for Carbohydrates**

**Molish test:** Take 2-3 ml of sample, add a few drops of  $\alpha$ -naphthol solution and shake well. Then listen carefully. Add sulfuric acid from both sides of the test tube and observe the formation of a pink ring where the two liquids meet.

#### **Tests for Protein**

**Biuret test:** Add biuret reagent to 3 ml of sample. Visible red colour formation indicates the presence of protein.

**Xanthoprotein test:** 3ml extract 1ml concentration. Add  $H_2SO_4$ . The formation of a white precipitate was analysed for the presence of protein.

#### **Tests for Amino acids**

**Ninhydrin test (General test):** Take 3 ml of extract and 3 drops of 5% ninhydrin solution and heat in a boiling water bath for 10 minutes. Blood or blue symptoms appear.

#### **Tests for Alkaloids**

Test solution was dissolved in dil. HCl, shake and filter.

**Wagner's test:** Add a few drops of Wagner reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

**Hager's test:** Add a few drops of Hager's reagent to 2-3 mL of filtered water. The formation of a yellow-colored precipitate was observed due to the presence of alkaloids.

**Mayer's test:** Add a few drops of Mayer's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

**Dragendorff's test:** Add a few drops of Dragendorff's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

#### Tests for Glycosides

**Kellar Kiliani test:** Add 2 ml of glacial acetic acid and 1 drop of ferric chloride and concentrated sulfuric acid to 2 ml of sample. The presence of glycosides forming a red-brown color was found at the junction of the two liquid layers, and the upper layer was blue-green.

#### Tests for Saponins

**Foam test:** The drug extract or dry powder was shaken with water and observe the formation of persistent foam.

#### Tests for Tannins and Phenolic Compounds

**Ferric chloride test:** Add few drops of 5% FeCl<sub>3</sub> solution, formation of bluish black color indicates the presence of phenols.

**Lead acetate test:** Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

**Potassium dichromate test:** Add few drops of 10% potassium dichromate, formation of red precipitate indicates the presence of phenols.

**Acetic acid test:** To 2-3 ml of sample and few drops of acetic acid solution were added. Formation of red colour solution was observed.

#### Tests for Flavonoids

**Lead acetate test:** Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

**Shinoda test (Magnesium hydrochloride reduction test):** Add some broken magnesium strips and concentrate for 2-3ml test sample. With slight heating, hydrochloric acid was added dropwise. Colour development from red to red is observed due to the presence of flavonoids.

#### Preparation of Extracts (*Selenicereus undatus*)

The fruit was collected, thoroughly washed and peeled to obtain the pulp. The pulp was juiced without adding water. Phytochemicals were extracted from the juice by macerating it with ethanol for 24 hours. After maceration, the ethanol extract was separated using a

separating funnel. Due to the presence of color (pink) in the ethanol extract, it was unsuitable for phytochemical testing. To remove the color, the extract underwent activated charcoal treatment with heat application. Following decolonization, the ethanol extract was filtered to prepare it for subsequent phytochemical tests.



**Fig.25: Collection and processing of fruit material.**

### **Phytochemical Tests**

#### **Test for Carbohydrates**

**Molish test:** Take 2-3 ml of sample, add a few drops of  $\alpha$ -naphthol solution and shake well. Then listen carefully. Add sulfuric acid from both sides of the test tube and observe the formation of a pink ring where the two liquids meet.

#### **Tests for Protein**

**Biuret test:** Add biuret reagent to 3 ml of sample. Visible red color formation indicates the presence of protein.

**Xanthoprotein test:** 3ml extract 1ml concentration. Add  $H_2SO_4$ . The formation of a white precipitate was analyzed for the presence of protein.

#### **Tests for Amino acids**

**Ninhydrin test (General test):** Take 3 ml of extract and 3 drops of 5% ninhydrin solution and heat in a boiling water bath for 10 minutes. Blood or blue symptoms appear.

#### **Tests for Alkaloids**

Test solution was dissolved in dil. HCl, shake and filter.

**Wagner's test:** Add a few drops of Wagner reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

**Hager's test:** Add a few drops of Hager's reagent to 2-3 mL of filtered water. The formation of a yellow-colored precipitate was observed due to the presence of alkaloids.

**Mayer's test:** Add a few drops of Mayer's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

**Dragendorff's test:** Add a few drops of Dragendorff's reagent to 2-3 mL of filtered water. The formation of a reddish-brown precipitate was observed due to the presence of alkaloids.

### Tests for Glycosides

**Kellar Kiliani test:** Add 2 ml of glacial acetic acid and 1 drop of ferric chloride and concentrated sulfuric acid to 2 ml of sample. The presence of glycosides forming a red-brown color was found at the junction of the two liquid layers, and the upper layer was blue-green.

### Tests for Saponins

**Foam test:** The drug extract or dry powder was shaken with water and observe the formation of persistent foam.

### Tests for Tannins and Phenolic Compounds

**Ferric chloride test:** Add few drops of 5% FeCl<sub>3</sub> solution, formation of bluish black color indicates the presence of phenols.

**Lead acetate test:** Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

**Potassium dichromate test:** Add few drops of 10% potassium dichromate, formation of red precipitate indicates the presence of phenols.

**Acetic acid test:** To 2-3 ml of sample and few drops of acetic acid solution were added. Formation of red color solution was observed.

### Tests for Flavonoids

**Lead acetate test:** Add few drops of Lead acetate solution, formation of white precipitates indicates the presence of phenols.

**Shinoda test (Magnesium hydrochloride reduction test):** Add some broken magnesium strips and concentrate for 2-3ml test sample. With slight heating, hydrochloric acid was

added drop wise. Color development from red to red is observed due to the presence of flavonoids.

## RESULTS

### Phytochemical Analysis of Dragon fruit species (*Selenicereus costaricensis*, *Selenicereus purpusii* and *Selenicereus undatus*)

This study reveals the phytochemicals extracted by ethanolic solvent from this fruit pulp. The phytochemicals analysis was carried out in this fruit pulp collected from three different regions of the farmers' fields. These extracts, after treatment with relevant reagents and chemicals, resulted in the ratio of specific phytochemicals.

**Table 2: Phytochemical Analysis of *Selenicereus costaricensis* (Primary metabolites and Secondary metabolites).**

| Sl.no. | Primary Metabolites | Secondary Metabolites | Results      |
|--------|---------------------|-----------------------|--------------|
| 1      | Carbohydrates       | —                     | Detected     |
| 2      | Proteins            | —                     | Detected     |
| 3      | —                   | Steroids              | Detected     |
| 4      | —                   | Alkaloids             | Not Detected |
| 5      | —                   | Tannins               | Detected     |
| 6      | —                   | Flavonoids            | Not Detected |
| 7      | —                   | Glycosides            | Not Detected |
| 8      | —                   | Saponins              | Detected     |

**Table 3: Phytochemical Analysis of *Selenicereus purpusii* (Primary metabolites and Secondary metabolites).**

| Sl. no. | Primary Metabolites | Secondary Metabolites | Results      |
|---------|---------------------|-----------------------|--------------|
| 1       | Carbohydrates       | —                     | Detected     |
| 2       | Proteins            | —                     | Detected     |
| 3       | —                   | Steroids              | Detected     |
| 4       | —                   | Alkaloids             | Not Detected |
| 5       | —                   | Tannins               | Detected     |
| 6       | —                   | Flavonoids            | Not Detected |
| 7       | —                   | Glycosides            | Not Detected |
| 8       | —                   | Saponins              | Detected     |

**Table 4: Phytochemical Analysis of *Selenicereus undatus* (Primary metabolites and Secondary metabolites).**

| Sl. no. | Primary Metabolites | Secondary Metabolites | Results      |
|---------|---------------------|-----------------------|--------------|
| 1       | Carbohydrates       | —                     | Detected     |
| 2       | Proteins            | —                     | Detected     |
| 3       | —                   | Steroids              | Detected     |
| 4       | —                   | Alkaloids             | Not Detected |

|   |   |            |              |
|---|---|------------|--------------|
| 5 | — | Tannins    | Not Detected |
| 6 | — | Flavonoids | Not Detected |
| 7 | — | Glycosides | Not Detected |
| 8 | — | Saponins   | Detected     |

Primary metabolites carbohydrates and proteins were detected in the ethanolic extracts of this fruit pulp (Tables.2, 3 and 4). This phytochemical analysis tested and detected for the secondary metabolites namely steroids, tannins and saponins (Tables.2,3 and 4). In *Selenicereus undatus*, only tannins are absent of (Table.4), Alkaloids, Flavonoids and Glycosides are completely absent from all three extracts of this fruits. (Tables.2,3 and 4).

The secondary metabolites present various pharmacological activities such antioxidants, antimicrobials, antibacterial anti-inflammatory, antipyretic and an aesthetics etc.

## DISCUSSION

The phytochemical study *Selenicereus* fruits are collected from three different regions of farmer's field. Subjected to Soxhlet extraction with ethanol various phytochemicals of pharmacological importance were identified in three extracts.

In This study revealed the presence of primary metabolites like carbohydrates and proteins. (Table.2,3 and 4) Zhang, et al. (2005). The phytochemical analysis detected secondary metabolites namely steroids, tannins and saponins, (Table.2 and 3) but tannins are absent in the *Selenicereus undatus* (Table.4) whereas alkaloids, flavonoids and glycosides in other three fruit species. (Table.2,3 and 4) (Shahin Hassanpour et al. 2011).

The two fruits *Selenicereus costaricensis*, *Selenicereus purpusii* having red, pink colour and showing the tannins whereas the white fruit of *Selenicereus undatus* do not containing tannins. Presence of tannins is the characteristic feature of coloured fruits, but they are absent in white pulp fruits.

Phytochemical analysis on this fruit extracts report detected for the presence of tannins, these are hastening healing wounds and inflamed mucus membrane (Khan et al. 2018).

Saponins were detected in these fruit extracts, exhibit anti-inflammatory, hypercholesteremic, immune modulatory, anti-fungal, anti-bacterial and hypoglycaemic properties. Reported by Madhurika and Karnakar Reddy (2023).

## CONCLUSIONS

This study reveals the phytochemicals extracted by ethanolic solvent from this fruit. The phytochemicals analysis was carried out on this fruit collected from three different regions of the farmers' fields. These extracts, after treatment with relevant reagents and chemicals, resulted in the ratio of specific phytochemicals.

In This study revealed the presence of primary metabolites like carbohydrates and proteins. (Table.2,3 and 4) Zhang, et al. (2005). The phytochemical analysis detected secondary metabolites namely steroids, tannins and saponins, (Table.2 and 3) but tannins are absent in the *Selenicereus undatus* (Table.4) whereas alkaloids, flavonoids and glycosides in other three fruit species (Table.2,3 and 4) (Shahin Hassanpour et al. 2011).

The two fruits *Selenicereus costaricensis*, *Selenicereus purpusii* having red, pink colour and showing the tannins whereas the white fruit of *Selenicereus undatus* (white pulp) do not containing tannins. Phytochemical analysis on this fruit extracts report detected for the presence of Tannins, these are hastening healing wounds and inflamed mucus membrane (Khan et al. 2018). Saponins were detected in this fruit extract, exhibit anti-inflammatory, hypercholesteraeamic, immune modulatory, anti-fungal, anti-bacterial and hypoglycaemic properties. By Madhurika and Karnakar Reddy (2023).

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