



## Comparison study of antioxidant activity on oregano seeds and jalapeno seed:

Souvik Dutta<sup>1\*</sup>, A. Ankitha<sup>2</sup>, B. Kalyani<sup>3</sup>, B. Lokesh<sup>3</sup>

Department of Pharmacology, Malla Reddy Pharmacy College, Secunderabad, Maisammaguda, Dhulapally, Medchal-Malkajgiri.

### ABSTRACT:

In this study, the antioxidant potential and inhibitory effects of oregano seed ethanolic extract (OSEE) were evaluated. ORAC, total phenolic content, and FRAP values were measured using an in vitro antioxidant assay including DPPH radical scavenging and ABTS cationic radical scavenging(1). For oregano seeds, use 80% ethanol, n-hexane, ethyl acetate, n-butanol, and water. The effect of in vitro disinfection of 180°C corn oil on oil consumption was determined. Ethyl acetate is the best product when it comes to removing free radicals. Ethyl acetate is a good solvent for extracting antioxidants from thyme (2).

Oxidative stress is the opposite of free radicals and antioxidants, so compounds that can reduce free radicals are now being investigated for medical use. Oregano (*Origanum vulgare* L.) is a medicinal plant used in the treatment of many health problems due to its antibacterial, carminative, and antioxidant properties. However, when taken orally, digestion may alter some treatments (3). Phytochemical analysis of thyme ethanol extract revealed that it contains many compounds such as tannins, ethyl acetate, triterpenes/steroids, alkaloids, flavonoids, and essential oils.

This study evaluated antioxidant activity (ORAC, hydroxyl radical, DPPH, and TEAC tests), as well as total phenols, flavonoids, capsaicin, and ascorbic acid, in fresh and processed jalapenos and serrano peppers, as well as bell peppers and canned jalapenos. Antioxidant activity of peppers (ORAC, hydroxyl radical, DPPH, and TEAC tests) Capsaicin, dihydrocapsaicin, and nordihydrocapsaicin are present in both fresh and processed peppers; however, the latter is measured only in fresh peppers (5). Processed peppers have lower antioxidant activity and fewer phytochemicals than fresh peppers. Ascorbic acid, total phenolics, and antioxidant activity are all interrelated. Chlorophyll in jalapeños and serrano peppers has antioxidant properties; this is confirmed by the decrease in DPPH scavenging activity of the extracts when chlorophyll is removed using silicic acid chromatography. Three CPSs (WPS, LPS, and BRPS) were evaluated for antioxidant quality,  $\alpha$ -glucosidase inhibitor activity (GIA), total phenolic content (TPC), and capsaicin concentration. We also examined the effect of using more polar solvents (e.g., 80% methanol, 80% acetone, and 80% ethanol) for the extraction of bioactive substances. Important Plants Capsaicin plants are often eaten or used as spices or medicine. Vitamins, carotenoids (CC), polyphenols (PPH), and capsaicinoids are a few of the phytochemicals present (6)

This study aims to comprehend the changes in phytochemistry caused by the different stages of the growth of hot pepper fruits. Five pepper populations (*Capsicum annuum* L.) were selected from the local area and cultivated in a field, with the fruits being harvested individually at the two fruit and red fruit phases. Total polyphenols, ascorbic acid, and antioxidant activity (DPPH and ABTS) were all assessed (7,8).

Keywords: Phytochemical screening, Antioxidant, Anticancer, capsaicinoid, flavonoid content, inflammation, gastric, hypersensitivity

### INTRODUCTION:

#### OREGANO:

The leaves of plants in the Lamiaceae family, such as thyme, marjoram, sage, basil, oregano, and mint, can be used fresh in food preparation or lightly dried to change color, taste, and aroma. Other properties they may find include good antioxidant capacity and anti-bacterial properties (9). Thyme (*Origanum vulgare* L.), commonly known as Badri Tulsi, Vantulsi, Sathra, and Jakhambooti, is one of the fragrant and versatile herbs of the Lamiaceae family. Baslooghas and Jonk-Jari in India. Oregano has its origins in the mountains of Western Asia and the Mediterranean region but is now also established in parts of Mexico and the United States. *O. vulgare* is cultivated in sub and temperate regions of India, particularly in the Himalayan area. It is one of the most traded culinary herbs in the world. Although it is native to the Mediterranean region, oregano is grown in Greece, the Dominican Republic, Mexico, Italy, and Turkey. It is found in the temperate Himalayas of India, ranging from Sikkim to Kashmir. It can be planted in any warm garden soil because it is a hardy plant. Oregano has traditionally been used as a spice in the food industry and cooking, as well as to support the nerves and intestines.

Additionally, the essential oil of this plant is used in aromatherapy and perfumes, especially in soaps. Other uses include preparing infusions with antispasmodic, sedative, carminative, expectorant, stomachic, and tonic properties to treat headaches, sore throats, colds, and digestive problems. Moreover, thanks to the reduction of free radicals and their antioxidant and cell protection effects in the body, vulgare content has been shown to have antioxidant activity in vitro. Free radical buildup within the body has been regarded as one of the considerations that contribute to the emergence of some aging-related disorders, making it worthwhile to find substances that can mitigate these. When it comes to a drug's pharmacological activity, the

route of administration is crucial. Because it provides the patient with greater comfort, oral administration is generally recommended. Throughout the particular instance of medicinal plants, the extracts' particle sizes can vary greatly, and the many chemical components that give them their activity might be altered by gastrointestinal

digestion, which changes pH and involves enzymes. Due to these factors, the pharmacokinetics and pharmacodynamics of these drugs may be significantly affected by oral administration. In vitro, models can be used in the laboratory to simulate the effects of digestion on the chemical processes of various extracted materials. Check its latest pharmacological properties in vivo and in vitro. The examination of DPPH% free radical scavenging activity is the most commonly used in vitro method for antioxidant quantification. However, *C. elegans* is a popular and useful in vivo model because it is inexpensive, easy to use, reproducible, and molecularly similar to humans (10).

Terpenoids and phenolic acids constitute most of the complex molecular composition of essential oils extracted from aromatic plants. The use of essential oils in food, pesticides, and medical applications is an important research topic in the pharmaceutical and cosmetic industries. Since essential oils and their volatile compounds have been shown to have many therapeutic potentials, their use in medicine has been attributed to their powerful medicinal and bioactive properties (11).

People around the Mediterranean region have used oregano for centuries in herbal medicine to treat many ailments, including:

- skins sores
- aching muscles
- asthma
- cramping
- diarrhea
- indigestion (12)

#### **medicinal uses of oregano:**

- The two primary ingredients of oregano essential oil are carvacrol and oregano. They might naturally be antibiotics.
- Oregano extract has demonstrated potential in reducing inflammation in animal models of autoimmune arthritis, allergic asthma, and rheumatoid arthritis. as a result of medications
- Additionally, studies have demonstrated that thymol and carvacrol can stop the spread of melanoma cells and skin expansion. Worried Mice
- TM Encourages Breathing oregano oil is occasionally used to help relieve the symptoms of respiratory conditions including cough and asthma because of its antibacterial qualities. Thyme's antioxidants lower the body's chances of developing chronic illnesses.
- Its leaves have traditionally been used medicinally to extract oil. It has been used for thousands of years to cure a variety of illnesses, including respiratory issues, and menstrual issues (13).

#### **JELAPENO:**

The fruit of the Solanaceae plant is called capsicum peppers. Hot pepper has many activities, such as antioxidant, free radical scavenger, antibacterial, antiviral, anti-inflammatory, and anti-cancer properties. Additionally, red pepper shows hypoglycemic activity due to inhibition of  $\alpha$ -amylase and  $\alpha$ -glucosidase. Although the yellow pepper bell pepper has a stronger  $\alpha$ -glucosidase inhibitory effect than red and green peppers, according to an analysis of 64 pigments in Mexican peppers, the main pigment in brown peppers is chlorophyll, but red peppers contain more cayenne pepper. Research shows that the antioxidant properties of peppers interfere with their activity. Researchers found that the bioactive properties of peppers were positively related to their antioxidant activity. The results showed that the antioxidant capacity (IC50) of various pepper varieties ranged from 135 to 366  $\mu$ g/mL. Measures active elements and their biological activities (14).

An important part of Mexico's social, economic, and cultural life is pepper cultivation. These are the two main groups of peppers. All peppers grown and sold in Mexico are called "jalapeño" peppers or peppers. Compared to 2020 data, the area planted with jalapeno fell 11.2% from 33,000 hectares in 2010. As connected devices focus more directly on consumer needs, new challenges arise. The Mediterranean diet is known for its frequent use of spices. The average daily food intake of spices such as paprika (paprika) in Europe is approximately 0.5 grams per person. Chili peppers are often used in dishes to enhance flavor and color. This fruit is rich in phytochemicals such as capsaicin, flavonoids, and phenols.

The Mediterranean diet is known for its frequent use of spices. The average daily food intake of spices such as paprika (paprika) in Europe is approximately 0.5 grams per person. Chili peppers are often used in dishes to enhance flavor and color. This fruit is rich in phytochemicals such as capsaicin, flavonoids, and phenols. Due to their strong antioxidant properties, these herbs are important in preventing dementia, cancer, and heart diseases. there is growing evidence that eating certain foods, diets, and regular beverages can reduce many indicators of oxidative damage in biological systems. This is because reactive oxygen species (ROS) play a role in many human diseases (15).

Bell pepper, also known as hot pepper, is known for its antioxidant properties. Bell peppers, which come in green, yellow, orange, and red colors, are widely researched to help many diseases, especially those related to the brain. In addition to the high content of provitamin A (beta-carotene) and other substances, bell peppers have many biological properties. In terms of color and nutritional value, red pepper contains more  $\beta$ -carotene than yellow pepper.

Because green peppers are often picked before they are fully ripe, changes in ripeness can affect their phytonutrient content, which is important for antioxidant nutrition. The Pepper is a vegetable containing vitamin (16).

In Mexico, capsicum (*Capsicum annuum*) is widely produced and used in raw, cooked, and processed forms. There are hot peppers, especially the jalapeño variety. Capsaicin gives them a unique spicy taste that only this particular plant can produce (17).

Jalapenos contain antioxidants, vitamins, minerals, and fiber and are low in calories. Rich in vitamins A and C, this product has good antioxidant properties, which can prevent free radical damage to cells, strengthen the body, and make the skin firm and shiny. It is also a good source of folate and vitamin B6, which are important for the body. Additionally, capsaicin, an alkaloid that gives peppers their spicyness and provides many health benefits, is one of the most active components of jalapeno (18).

#### Medicinal uses of jalapeno:

- Anti-inflammatory effects capsaicin in jalapenos has been shown to reduce inflammation and pain.
- Improves digestion eating jalapenos can help prevent constipation and indigestion. Mold control capsaicin's thermal effects increase body fat and calorie burning, which may aid weight loss.
- Cancer jalapenos are rich in vitamin C, which is known to fight free radicals thought to cause cancer cell proliferation. It contains a herb called capsaicin, which can kill some cancer cells. Kill bacteria research shows that certain ingredients in jalapeno can eliminate bad bacteria, which can help treat conditions like sore throats and tooth decay.
- Treatment Painkillers for muscle and joint pain, especially arthritis, are made from capsaicin derived from jalapeno peppers. To reduce pain, capsaicin cream works by desensitizing nerve receptors in the skin.
- Heart health components such as flavonoids and capsaicin found in jalapenos may have beneficial effects on the heart, including lowering blood pressure and improving circulation. However, more research is needed to confirm these effects (19).

#### TAXONOMICAL CLASSIFICATION OF OREGANO

kingdom	Plantae- plants
Subkingdom	Trachecobionta
super division	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
subclass	Asteridae
Order	Lamiales
Family	Lamiaceae
Genus	Origanum L
Species	Origanum vulgare

Oregano is said to bring "mountains of joy." Also known as thyme or wild marjoram, this aromatic herb belongs to the mint family (Lamiaceae) and is valued for its dry leaves and flower tops. This herb is often used in cooking as well as salads and is an important ingredient in many recipes (20).

- **Varieties:** Aureum, Greek Kaliteri, Hot & Spicy, Nana, Common Marjoram, Turkish Oregano, Wild Marjoram, True Oregano, and Winter Marjoram, White Oregano, Greek oregano, Spanish oregano, and Mexican oregano.
- **Climate and soil:** This crop grows best in warm climates. It can grow in low and high places. The best temperature for thyme to grow and develop is between 18°C and 22°C. Thyme likes well-drained soil with a slightly alkaline of 6.8 to 7.5. pH. Herbaceous perennial, with leaves that are 1 to 4 cm (0.39 to 1.57 in) long and 30 to 90 cm tall. The optimal pH range for thyme growth is 6.0 to 4.0. The flowers of thyme are in straight rows and range in length from 3 to 5 mm (0.12 to 0.16 in). Not much is added by it. It has large, oval-shaped leaves. There are blue or pink flowers available. The fruit is tiny and has a glossy chocolate color. This plant's branches are composed of wood. Tiny, tiny glands found in leaves release essential oils that give plants their color and fragrance (21). The temperate Himalayas of India, spanning from Sikkim to Kashmir, are home to it. This plant can flourish in tropical gardens because it is hardy. The plant prefers temperatures in the subtropical region and grows best in full sun and well-drained soil (22).

#### Traditional uses of oregano:

In traditional medicine, oregano has been used for

- respiratory conditions (i.e., asthma, bronchitis, cough),
- gastrointestinal (i.e., diarrhea, indigestions, stomach-aches),
- anti-bacterial

- anti-inflammatory
- menstrual disorders
- Diabetes <sup>(23)</sup>.

---

## TAXONOMICAL CLASSIFICATION OF JELAPENO

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Solanales
Family	Solanaceae
Genus	Capsicum
Species	Annum

The fruit of the pepper is the jalapeno pepper. It is a medium-sized pepper compared to other peppers, growing to 6 inches or more, with an average length of 2-3.5 inches<sup>(24)</sup>. Purple Jalapeno, Fresno Jalapeno Type: Generally, resembles a cone-shaped fruit, jalapenos tapering at the end. They are about an inch in diameter and two to three inches long. When not fully ripe, jalapenos' smooth, shiny skin is green. When ripe, jalapeños turn purple or red, depending on the variety. Tiny seeds cluster near the center of the thick, crunchy flesh<sup>(25)</sup>.

---

### Traditional uses of jalapeno:

In traditional medicine, jalapeno has been used for

- respiratory conditions (i.e., asthma, bronchitis, cough),
- gastrointestinal (i.e., diarrhea, indigestions, stomach-aches),
- anti-bacterial
- anti-inflammatory
- anti-viral
- anti-bacterial
- Pain relief
- Weight management
- Respiratory health
- Appetite control
- Circulatory system support <sup>(26)</sup>

---

## PHARMACOLOGICAL BIOACTIVITIES OF OREGANO AND JALAPENO:

### *Anti-obesity Activity:*

The most important enzyme that breaks down triglycerides is pancreatic lipase. Altering lipid metabolism by inhibiting dietary fat intake is one way to prevent or treat obesity. Anti-lipase activity was measured by turbidimetric analysis. The methanol extract of *Oregano vulgare* exhibited pancreatic lipase inhibitory activity.

### *Anti-Allergic Effects:*

According to research, capsaicin may have anti-allergic properties that can reduce allergy symptoms such as swelling and itching. However, more research is needed to confirm these effects <sup>(27, 28)</sup>.

### *Antioxidant activity:*

Many rice extracts and essential oils have been reported to have antioxidant activity. They found potent DPPH scavenging and lipid peroxidation protection, H<sub>2</sub>O<sub>2</sub> neutralizing activity, and no antioxidant activity in liposomes, and *O. vulgare* was evaluated to have antioxidant activity in various extracts and essential oils. They have strong DPPH-scavenging activity and prevent lipid peroxidation. Liposomes neutralize NO and H<sub>2</sub>O<sub>2</sub> activity <sup>29</sup>.

### *Anti-inflammatory:*

Pepper has strong anti-inflammatory properties. Phenolic and flavonoid compounds found in pepper have been shown to have anti-inflammatory properties. Capsaicin and capsaicinoids have also been shown to have anti-inflammatory and antibacterial properties. Capsicum has anti-inflammatory

properties when applied to lipopolysaccharide-stimulated macrophage models. It is claimed that capsaicin can be administered topically or orally to reduce fever, unpleasant chemical hyperalgesia, and rheumatoid arthritis.

#### ***Neuroprotective Effects:***

Some studies suggest that capsaicin may have neuroprotective properties and help protect nerves from damage or degeneration. This may affect diseases such as Alzheimer's and Parkinson's disease, more research is needed (30, 31).

#### ***Antiplatelet Activity:***

Essential oil from *Oregano vulgare* exhibits antiplatelet activity by inhibiting clot contraction in the blood of guinea pigs and mice. There is a relationship between antiplatelet potency and phenylalanine content, indicating that these components play an important role in preventing thrombosis (32).

#### ***Antibacterial activity:***

*Oregano vulgare* essential oil has antibacterial properties against *Escherichia coli*, *Bacillus subtilis*, and *Enterobacter cloacae*. In addition to *Helicobacter pylori*, *Micrococcus flavum*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella enteritidis*, *Staphylococcus aureus*, *Staphylococcus aureus*, and related bacteria.

#### ***Potential analgesic effect:***

*Oregano*, the aqueous extract of *Vulgare*, has anti-inflammatory properties. Latency in response to thermal stimulation in rats using the tail flick test. Co-administration of *O. vulgare* extract and baclofen reduced response latency compared to the control group.

#### ***Anti-cancer activity:***

The main substance that gives peppers their spicy taste is capsaicin. Capsaicin has been documented to inhibit the growth of prostate cancer cells both in vivo and in vitro. Cayenne pepper stimulates the natural production of capsaicinoids, an important class of compounds derived from cayenne peppers whose anti-cancer effects have been studied in vitro and in vivo. It has been reported that hot pepper, a plant of Mexican origin used in ethnomedicine, is effective against stomach infections (33).

#### ***Anti-viral activity:***

It has been found that hot pepper contains many compounds that are effective against many diseases. One such example is cis-capsaicin, also known as Civamide, which, in addition to being effective against herpes simplex virus (HSV) infection in guinea pigs, has also been evaluated as a treatment for migraines. Civamide is said to prevent viral infections. Similarly, capsaicin has been documented to have specific effects on sensory neurons that directly impact the transmission and persistence of HSV infection.

---

## **CONCLUSION:**

A comparative study on the antioxidant activity of oregano seeds and jalapeno seeds showed that both seeds have high antioxidant capacity. However, thyme seeds have more antioxidant power than jalapeno seeds. This may be due to the difference in the phytochemical composition of various seeds. More research will be needed to identify the same chemicals responsible for the antioxidant properties and health benefits. Thyme seeds, in particular, are a promising source of antioxidants for many nutritional and medicinal uses. Further research on the bioactive substances found in the two seeds could provide important information about their functions and therapeutic potential. Additionally, researching the best extraction methods and dosages can improve results.

## **REFERENCES:**

1. Chang Hee Han, Min-Ah Kim, Mi-Ja Kim Antioxidant properties and oxidative stability of oregano seed ethanol extract Oct 02, 2018.
2. Hyun-Jong Lee1, Min-Ah Kim1, Sungsil Hong2, and Mi-Ja Kim Evaluation of antioxidant properties and oxidative stability of oregano seed capsicum spp, or chili peppers, are significant plants that are typically eaten or used as a spice or medication. Numerous phytochemicals, including vitamins, carotenoids (CC), polyphenols (PPH), and capsaicinoids, were present in them on September 22, 2020.
3. pharmaceutical form María Pilar de Torrea, Jose Luis Vizmanosb,c, Rita Yolanda Caverob,d, María Isabel Calvoa,b Improvement of antioxidant activity of oregano (*Origanum vulgare* L.) with an oral pharmaceutical form 13 May 2020.
4. Stem Bark Extracts Rosmalena, Putu Ayu Widyastuti , Fatmawaty Yazid1 , Neneng Siti Silfi Ambarwati, Islamudin Ahmad . Phytochemicals and Antioxidant Activities Evaluation of *Origanum vulgare* 31-03-2021.
5. Emilio Alvarez-parrilla, Laura A. de la Rosa, Ryszard Amarowicz Antioxidant Activity of Fresh and Processed Jalapeño and Serrano Pepper December 2, 2010.

6. Yida Liua, Yulian Chenb, Yuanliang Wanga, Jiaxu Chena, Yuxin Huanga, Yingzi Yana, Luoming Lia, Zongjun Lia Total phenolics, capsaicinoids, antioxidant activity, and  $\alpha$ -glucosidase inhibitory activity of three varieties of pepper seeds 10 February 2020.
7. Maria DINUI, Rodica SOARE2, Gheorghita HOZA3 and Cristina In phytochemical and antioxidant activity of hot pepper fruits on maturity stages, cultivation areas and genotype 2014.
8. Yahaya Gavamukulya1, Faten Abou-Elella2, Fred Wamunyokoli1, Phytochemical screening, anti-oxidant activity and in vitro anticancer potential of ethanolic and water leaves extracts of *Annona muricata* 8 Jul 2014.
9. Boroski, M., 2Aguilar, A. C., 2Rotta, E. M., 3Bonafe, E. G., 4Valderrama, P., 2Souza, N. E., and 2Visentainer, J. V, Antioxidant activity of herbs and extracted phenolics from oregano in canola oil,19 February 2018
10. Ankita Maithani1, Umesh Maithani 2 and Maneesha Singh Botanical Description, Cultivation Practices, Essential Oil Composition and Therapeutic Values of *Origanum vulgare* L. and its Future ProspectiveReceived: 18 Apr 2020
11. María Pilar de Torrea, Jose Luis Vizmanosb,c, Rita Yolanda Caverob,d María Isabel Calvoa,b Improvement of antioxidant activity of oregano (*Origanum vulgare* L.) with an oral pharmaceutical form, 26 May 2020.
12. Natalie Butler, R.D., L.D. — By Yvette Brazier Medically reviewed by health benefits of oregano on November 8, 2023
13. Natalie Butler, R.D., L.D. — By Yvette Brazier Medically reviewed by health benefits of oregano on November 8, 2023
14. Roozbeh Farhoudi, Mohammad Amin Mehrnia & Dong-Jin Lee Antioxidant activities and bioactive compounds of five Jalapeno peppers (*Capsicum annuum*) cultivars 1 May 2017.
15. overlay panelMonica R. Loizzo, Alessandro Pugliese, Marco Bonesi, Francesco Menichini, Rosa Tundis Evaluation of chemical profile and antioxidant activity of twenty cultivars from *Capsicum annuum*, *Capsicum baccatum*, *Capsicum chacoense*, and *Capsicum chinense*: A comparison between fresh and processed peppers 25 May 2015.
16. Narmin Yazdizadeh Shotorbani,1 Rashid Jamei, and Reza Heidari Antioxidant activities of two sweet pepper *Capsicum annuum* L. varieties phenolic extracts and the effects of thermal treatment.
17. Venancio Cuevas-Reyes, Zein Kallas 3 and Jorge A. Zegbe Preferences in ‘Jalapeño’ Pepper Attributes: A Choice Study in Mexico
18. Sudip Kumar Mandal, Santosh Kumar Rath, Rajan Logesh, Siddhartha Kumar Mishra, Hari Prasad Devkota, Niranjan Das *Capsicum annuum* L. and its bioactive constituents: A critical review of a traditional culinary spice in terms of its modern pharmacological potentials with toxicological issues 18 October 2022.
19. Brhan Khair Saleh, Abdella Omer, Belay Teweldemedhin Medicinal uses and health benefits of chili pepper (*Capsicum* spp) May 29, 2018.
20. Kamran Javed Naquvi, Javed Ahamad, Afrin Salma, S. H. Ansari, A. K. Najmi Critical review on traditional uses, phytochemistry and pharmacological uses of oregano *vulgare* Linn. 15 Dec 2018.
21. Irimi Sarrou, Nektaria Tsivelika, Paschalina Chatzopoulou, George Tsakalidis, Georgios Menexes, Athanasios Mavromatis (*Origanum vulgare* ssp. *hirtum*) and development of improved cultivars for yield potential and essential oil. 15 January 2017.
22. Jacob P. Veenstra and Jeremy J. Johnson Oregano (*oregano vulgare*) extract for food preservation and improvement in gastrointestinal health 2019 Apr 9
23. Jacob P. Veenstra and Jeremy J. Johnson oregano (*Origanum vulgare*) extract for food preservation and improvement in gastrointestinal health 2019 Apr 9 23.
24. Swamy, K.R.M Origin, Distribution, Taxonomy, Botanical, Description, Genetic of capsicum (*capsicum annuum*. L) 16 January 2023
25. Ravneet K. Sandhu, Nathan S. Boyd, Qi Qiu, Zhegfei Guan Optimization of planting dates of Jalapeno pepper (*Capsicum annuum* ‘Jalapeño’ L.) and cantaloupe (*Cucumis Cucumis melo* var. *cantalupensis cantalupensis* Ser.) relay cropped with strawberry July 27, 2020.
26. Katarzyna Rybak, Artur Wiktor Dorota Witrowa-Rajchert Oleksii Parniakov The effect of traditional and non-thermal treatment on the bioactive compound and sugars content of red bell pepper 21 July 2020
27. Kamran Javed Naquvi, Javed Ahamad, Afrin Salma, S. H. Ansari, A. K. Najmi Critical review on traditional uses, phytochemistry and pharmacological uses of oregano *vulgare* Linn. 15 Dec 2018.
28. Kamran Javed Naquvi, Javed Ahamad, Afrin Salma, S. H. Ansari, A. K. Najmi Critical review on traditional uses, phytochemistry and pharmacological uses of oregano *vulgare* Linn. 15 Dec 2018.
29. Farhan A. Khan, Tariq Mahmood, Muhammad Ali, Abdul Saeed & Aneela Maali Pharmacological importance of an ethnobotanical plant: *Capsicum annuum* L. 21 May 2014.
30. Saba Soltani, Abolfazl Shakeri,b Mehrdad Iranshahi,c and Motahareh Boozarib, A Review of the Phytochemistry and Antimicrobial Properties of *Origanum vulgare* L. and Subspecies 2017
31. Saba Soltani, Abolfazl Shakeri, Mehrdad Iranshahi, and Motahareh Boozarib, A Review of the Phytochemistry and Antimicrobial Properties of *Origanum vulgare* L. and Subspecies 2017
32. T, Mochida K, Kozuka M, Hashimoto K, Nishino H Cancer activity of carotenoids in the fruit of red capsicum *annuum* L. 2001.
33. Apostolidis E, Shetty K. Evaluation of pepper (*Capsicum annuum*) for management of diabetes and hypertension. *J Food Biochem*. Spicing up a vegetarian diet 2007.