

Peelings of citrus fruits as a precious resource of phytochemical and vital bioactive medicines during Covid: 19 periods

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Abstract

There are several advantages of natural products in terms of their utility, degradability, value, etc. for human beings and the environment. In the current environmental challenges, the world is facing tremendous pressure to find a solution to the epidemic coronavirus disease as well as waste management. Sustainable development means to minimize the use of natural resources and to increase the efficiency of the product. This concept has been implemented in the current study by taking a different variety of Citrus plants belonging to the family Rutaceae, which include fruits such as orange, mandarin, lime, lemon, sour orange and grapefruit which appear as a well-known promising source of multiple beneficial nutrients for human beings and can fight against viruses and bacteria. The waste of the fruit i.e. the peel of the fruit is being taken for further processing to create citrus by-products which potentially represent a rich source of phenolic compounds and dietary fibre. These citrus fruit residues, which are generally discarded as waste in the environment, can act as potential nutritional resources to fight against the epidemic of coronavirus. Due to their low cost and easy availability, such wastes are capable of offering significant low-cost nutritional dietary supplements. Citrus processing industries generate huge amounts of wastes every year and citrus peel waste alone accounts for almost 50% of the wet fruit mass. Citrus wastes not only possesses immense economic value but also has the potential to increase immunity as it contains abundant amounts of various flavonoids, carotenoids, dietary fibre, sugars, polyphenols, essential oils, ascorbic acid and considerable amounts of some trace elements. The present work was carried out for targeting the value addition in the waste (peel of citrus fruits) and finding the active bio enzyme compounds by different methods of extraction from the citrus wastes/by-products and its potential utility as a source of various functional compounds.

Keywords: peel waste, citrus, bio-active compound, mineral composition, Covid-19

1. Introduction

There are a few points of interest of characteristic of citrus fruits, as far as their utility, degradability, value, and so forth for people and the environment. In the current ecological difficulties, the world is confronting colossal strain to find a way for survival against the corona virus. Economic improvement intends to limit the utilization of common assets and to expand the effectiveness of the item. This idea has been executed in the present investigation by taking an alternate assortment of Citrus plants having a place with the family Rutaceae, which incorporate organic products, for example, orange, mandarin, lemon, rough lime, sour orange and grapefruit which show up as a notable promising wellspring of different useful supplements for individuals. The misuse of the organic product, for example, the strip of the organic product is being taken for additional handling to make citrus side-effects which conceivably speak to a rich wellspring of phenolic mixes and dietary fibre.

These citrus organic product build-ups, in which most of its part is disposed of as waste in the environment, can go about as potential dietary assets. Because of their minimal effort and simple accessibility, such squanders are equipped for offering huge ease of healthful dietary enhancements, especially during such epidemic disease. Citrus handling ventures create immense measures of squanders each year and citrus strip squander alone records for practically half of the wet natural product mass. Citrus squanders are of gigantic monetary incentive as it contains bottomless measures of different flavonoids, carotenoids, dietary fiber,

sugars, polyphenols, fundamental oils, ascorbic corrosive, and significant measures of some follow components. The current work was done for focusing on the worth expansion in the waste (strip of citrus leafy foods) the dynamic bio-catalyst mixes by various strategies for extraction from the citrus squanders side-effects and its potential utility as a wellspring of different utilitarian mixes.

Studies have uncovered that expanded utilization of citrus natural products is related to decreased danger of sickness due to harmful bacteria and viruses and this might be ascribed to the nearness of common cancer prevention agents, Vitamin C, phenol, catalyse, protein, sugar, and so forth the plant phenolic are generally present in the natural products, seeds, pulps and strips. In the citrus natural product, compound as well as a supplement, are available in form of Iron, Calcium, Magnesium, Potash, Sodium, etc. The morphological citrus organic product species in various sizes and shapes are accessible. Citrus strip in establishing bunches of compound, protein, and minerals are available, however due to lack of mindfulness such important and precious material is not utilized or reused.

Material and Methodology

Sample collection

The fruits had collected from the market and remove the peel for further analytical work. In the material used of some citrus family fruits peel like *C. Aurantifolia*(L), *C. Maxima*, *C. Jambhiri*, *C. limetta*, *C. Medica* (L), *C. Reticulata*, *C. Reticulate Blanco*. Those fruit waste part (peel) are used in this experiment.

Estimation of phenol

Phenols estimation can be carried out with folin-Ciocalteu reagent (FCR). Phenols react with an oxidizing agent phosphomolybdate in Folin-Ciocalteu reagent under alkaline condition and results in the formation of a blue coloured complex, the molybdenum blue which is measured at 650 nm calorimetrically (Bray and Thorpe, 1954).

Estimation of DPPH (Antioxidant)

DPPH is the free radical scavenging activity of extract was measured in terms of hydrogen donating or radical scavenging ability using stable radical DPPH. Requirement of DPPH analysis in 0.1 mM DPPH solution in methanol (4mg DPPH in 100 ml Methanol), standard Vitamin C (10mg/10ml), extract the sample in ethanol with different concentration (20-100 µg/ml).

Estimation of ascorbic acid (Vitamin C)

Ascorbic acid is also determined calorimetrically. This method gives an accurate analysis of ascorbic acid content that the dye method. Ascorbic acid is first dehydrogenated by bromination. The dehydro ascorbic acid is then reacted with 2,4-dinitrophenyl hydrazine to form osazone and dissolved in sulphuric acid to give an orange-red color solution which is measured at 540nm.

Estimation of total/true protein

The lowry reaction for protein estimation is an extension of the biuret method. Method development by (Lowry et.al, 1951) [4], is about 10 times more sensitive than the biuret method. Protein reacts with the Folin-Ciocalteu reagent (FCR) to give a blue-coloured complex. The colour so formed is due to the reaction of the alkaline copper with the protein as in the biuret test and the reduction of phospholyhdic components. In the FCR by the amino acids tyrosine and tryptophan present ion the protein. The intensity of the blue colour is measured calorimetrically at 650nm.

Estimation of total soluble sugar (TSS)

The amount of total soluble sugar can be estimated using either anthrone or phenol sulphuric acid method calorimetrically. The anthrone reaction is the basis of a rapid and convenient method for the determination of hexoses, aldopentoses and hexuronic acids either free or present in polysaccharides. Carbohydrates are dehydrated by conc. H₂SO₄ to form furfural. Furfural condenses with anthrone (10 keto-9,10-dihydro-anthracene) to form a blue-green coloured complex which is measured calorimetrically at 630nm.

Estimation of minerals

Iron is estimated by colorimetric method. The iron is present in the citrus peel in very small amount. The estimation of zinc by EDTA titration method. Calcium and Magnesium method, called as complexometric titration, is used to find the calcium content of milk, the 'hardness' of water and the amount of calcium carbonate in various solid materials.

The method uses a very large molecule called EDTA which forms a complex with calcium and magnesium ions. Alkali metals like Sodium and Potassium were estimated using Flame Emission Photometry.

pH and EC

Estimation of potential hydrogen (pH) and electric conductivity (EC) is by particular reading meters

Result and Discussion

Primarily, considering the physical weight of the peel of the citrus fruits were calculated, in which a large variation was observed in different species of citrus. *C. maxima* was found to be in heavier in weight (1199 gm) compared to that of other citrus species which were ranging from 500 gm to 753 gm. Whereas, weight of the biomass in *C. aurantifolia* (33.33%) was noted with higher values than that of other species of citrus. Interestingly, the results of weight and diameter showed that as diameter increases in citrus species, percentage of biomass decreases.

Table 1: Biomass of citrus fruit peel

Species name	Total weight	Total no. of fruit	Peel diameter	Biomass
	(gm)	(no.)	(cm)	(%)
<i>C. aurantifolia</i>	500	13	0.2	33.33
<i>C. reticulata</i>	500	2	0.7	32.05
<i>C. limetta</i>	648	2	1	24.06
<i>C. maxima</i>	1199	1	1.7	22.40
<i>C. jambhiri</i>	603	1	2.6	11.71
<i>C. reticulata</i>	753	5	0.5	26.66
<i>C. medica</i>	500	3	1.3	29.54

Phenol (0.64 mg/100g), DPPH (15.22 %) and Iron (684.38 ppm) concentration in peel of *Citrus maxima* was observed to be highest compared to that of other citrus species taken for the study. Whereas, Ascorbic acid (0.45 mg/100g) and total protein (2.33 %) content was noted to be maximum in *C. reticulata* and in other species of citrus the content was ranging between 0.18 to 0.32 mg/100g and 1.33 to 2.33 %, respectively. Highest value of total sugar (52.33%) was observed in *C. medica*, while zinc (11.6 ppm) concentration was noted to be maximum in *C. jambhiri* peel. Concentration of calcium (18.9 ppm), magnesium (21.7 ppm), potassium (154 ppm) and sodium (1.99 ppm) was observed to be highest in *C. aurantifolia*. pH of all the peel of citrus fruits taken for the study was observed to be in range of 7.2 to 7.6.

Looking forward to the data of phenol (0.4 mg/100g) and zinc (7.53 ppm) concentration was noted to be lowest in *C. reticulata* than that of all other species of citrus. Values of DPPH (5.25 %), total protein (1.33%) and magnesium (6.3 ppm) were observed to be less in *C. jambhiri* compared to other species. Concentration of ascorbic acid (0.18mg/100g) and potassium (127 ppm) were observed to lowest in *C. maxima*. Total soluble sugar (8.67%) and sodium (0.21 ppm) content was lower in *C. limetta* than that of other species of citrus.

Table 2: Concentration of different elements in peel of citrus fruit

Compound	<i>C. aurantifolia</i>	<i>C. reticulata</i>	<i>C. limetta</i>	<i>C. maxima</i>	<i>C. jambhiri</i>	<i>C. reticulata</i>	<i>C. medica</i>
Phenol, mg/100g	0.52	0.40	0.47	0.64	0.41	0.57	0.68
DPPH, %	7.87	12.46	8.27	15.22	5.25	6.70	7.11
Ascorbic acid, mg/100g	0.40	0.45	0.32	0.18	0.30	0.24	0.31
Total protein, %	1.79	2.33	2.22	2.29	1.33	1.43	2.03
Total soluble sugar, %	17.30	12.7	8.67	47.55	43.22	42.33	52.33
Iron, ppm	106.58	163.84	184.62	684.38	156.68	147.92	338.58
Zinc, ppm	10.54	7.53	6.84	9.26	11.6	7.83	10.9
Calcium, ppm	18.9	7.4	7.7	7.3	5.7	5.0	7.0
Magnesium, ppm	21.7	7.9	8.1	8.3	6.3	6.6	7.6
Potassium, ppm	154	137	133	127	137	141	146
Sodium, ppm	1.99	0.54	0.21	0.68	1.82	1.09	1.09
EC, μ S/cm	855.8	1280.4	463.5	504.2	443.1	461.0	520.2
pH	7.4	7.2	7.4	7.4	7.6	7.7	7.6

References

- Hedge JE, Hofreiter BT. Determination of reducing sugars and carbohydrates. I. Analysis and preparation of sugars. *Methods in Carbohydrate Chemistry*. Academic Press, New York, 1962, 1-18.
- Kandoliya UK, Bajaniya VK, Bhadja NK, Bodar NP, Golakiya BA. Antioxidant and nutritional components of eggplant (*Solanum melongena* L.) fruit grown in Saurashtra region. *Int J Curr Microbio lApplSci*. 2015; 4(2):806-813.
- Kusuma HS, Putra AFP, Mahfud M. Comparison of two isolation methods for essential oils from orange peel (*Citrus auranticum* L) as a growth promoter for fish: microwave steam distillation and conventional steam distillation. *Journal of Aquaculture Research and Development*. 2016; 7(2):409.
- Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with the Folin phenol reagent. *Journal of biological chemistry*. 1951; 193:265-275.
- Sharma K, Mahato N, Cho MH, Lee YR. Converting citrus wastes into value-added products: Economic and environmentally friendly approaches. *Nutrition*. 2017; 34:29-46.
- Ting SV. Nutrients and nutrition of citrus fruits, 2019.