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Phytochemical screening of Co (On) 5 and Co (On) 6 Aggregatum onion by GCMS

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Abstract

Onion is one of the most important vegetable crops, mainly grown in the southern part of Tamil Nadu, India. It contains many phytonutrients which contribute to the significant nutritional values of human health. The phytochemical screening was conducted with Tamil Nadu Agricultural University released varieties viz., Co (On) 5 and Co (On) 6. GCMS analysis concluded the elution of many beneficial compounds, for instance, squalene, triterpenoid acting as a cholesterol lowering agent, eluted in both the varieties at 26.4 min. Similarly many other important phytonutrients identified in the same onion varieties are ascorbic acid, saturated fatty acids and monounsaturated fatty acids and so on. The phytochemical screening provides the preliminary information's on metabolites present in the Co (On) 5 and Co (On) 6 onion varieties of Tamil Nadu.

Keywords: *Allium cepa* L. var *aggregatum* Don, Co (On) 5, Co (On) 6, phytochemicals, squalene

Introduction

Onion (*Allium cepa* L.) belonging to the family Liliaceae is an important vegetable grown throughout the world and main cash crop consumed in India. The world review of major vegetables shows that onion ranks second to tomato in area. Two types of onion are commercially grown in India. The first type is named as common onion *Allium cepa* L, bulbs are large, normally single, and is propagated through seeds. The another type is multiplier onion *Allium cepa* L. var *aggregatum* Don, which produces bulbs of smaller size and is numerous to form an aggregated cluster. The propagation is by bulbs and some varieties by seeds^[1].

It is very important in cookery and there is a constant demand throughout the year worldwide. Therefore, it is called as "Queen of Kitchen"^[2]. Commercially onion is grown over hundred countries around the world and the top onion producers are China, India, USA, Pakistan, Turkey, Russia, Iran, Brazil, Mexico, and Spain. India ranks second and accounting for 8% of world's production. The onion production during 2020–2021, was 22.8 million metric tons obtained from an area of 1.22 million hectares. In Tamil Nadu, onion is grown with a production of 0.750 million metric tons with the 0.027 million hectares. In that, sixty percent of the total produce comes from *rabi* season crops harvested during April and May. The remaining produce comes from *kharif* and late *kharif* crops, which are harvested in October–November and January–February, respectively^[3].

Onion contains many bioactive compounds with numerous beneficial effects. It includes anti-inflammatory, antioxidant, anti-obesity, anti-diabetic, anticancer, anti-allergic, cardiovascular protective, neuro protective, respiratory protective and bacteriostatic properties [4]. Onion is a vital source of several phytonutrients such as flavonoids, fructose oligosaccharides (FOS), thiosulfates and other sulfur compounds. Moreover, it contains high levels of phenolic compounds^[5]. In which flavonoids are the major phenolic, which can be classified to different subclasses (flavones, flavones, flavonols, isoflavones, flavanonols, flavanols, chalcones, and anthocyanin's^[6]).

The present study is focused on the phytochemical screening of Tamil Nadu Agricultural University released onion varieties namely, Co (On) 5 and Co (On) 6 which was grown in Perambalur District, Tamil Nadu, and India. This onion is propagated by seeds and these are the most widely consumed aggregatum onion in Perambalur District, Tamil Nadu.

Materials and Methods

Collection and preparation of onion extracts

The Co (On) 5 and Co (On) 6 aggregatum onion varieties are released by Tamil Nadu Agricultural University. The onion samples for the study were collected from the farmer's field at Perambalur district by following proper sampling procedures. The collected onion samples were first cleaned and finely cut into cubes of 8 mm size, which were then dried in static oven for 72 hours at 40 °C. The dried onion were deep frozen with liquid nitrogen and immediately pounded with mortar and pestle, until a fine and homogenous powder was obtained. The powder was used for further GCMS analysis [7].

Dry plant material (10 g) was homogenized using 70% methanol: water (v/v; 100 mL) and stirred for 30 min at room temperature using magnetic stirrer. The extract was centrifuged at 3000 rpm for 15 min and the supernatants were pooled together and dried under vacuum using a rotary evaporator. After evaporating the solvent, samples were dried in a vacuum oven until they reached constant weight. The dry residues were dissolved with 10% DMSO. For GCMS analysis, the solution was filtered through a 0.45µm nylon filter disc prior to analysis [8].

Metabolites identification by GCMS/MS

The equipment Perkin Elmer Clarus SQ8C is employed to analyses the phytochemical screening of aggregatum onion with a DB 5 MS capillary column (30-m x 0.25-mm i.e. x 0.25 µm FT). The sample injected was 1 µl, with the injector temperature was maintained at 280 °C. The oven temperature is programmed at 35 °C and kept on hold for 3.50 min. The temperature was slowly increased up to 140°C at the rate of 2 °C/ min and continued up to 280 °C at the rate of 10 °C/min for 12 min before placing on hold. The MS program library used was NIST (National Institute Standard and Technology) Version 2020. The interpretation of the results through MS was done based on the NIST database and the spectrum of unknown samples was compared with known ones which is stored in the Library database [9, 10].

Results and Discussion

Phytochemical screening by GCMS

The detailed information of all the identified onion phytochemicals with highest probability are presented in Table 1 and the mass spectrum of the compounds with respective retention time (RT) are shown in Fig.1.

Table 1: Phytochemical screening of onion by GCMS

S. No.	Sample I - Co (On) 5	Retention time	Peak Area %	Probability %
1	Compound name			
2	Oxirane, 3-ethyl-2,2-dimethyl-	3.254	1.165	43.6
3	3,4-Hexanediol, 2,5-dimethyl-	3.479	1.14	24.9
4	Propane, 2,2-dimethoxy-	3.479	1.140	21.0
5	Dodecanese, 2,6,11-trimethyl-	9.221	1.04	21.0
6	Pentad cane, 2,6,10-trimethyl-	11.357	0.627	20.5
	n-Hexadecanoic acid	21.546	1.621	68.6
7	1-(+)-Ascorbic acid 2,6-dihexadecanoate	21.546	1.621	15.4
8	Squalling	26.383	3.405	30.6
9	Supraene	26.383	3.405	23.5
10	Pyrimidine, 1-(1-oxo-7,10-hexadecadienyl)-	27.868	1.141	40.8
11	2-Pyrrolidinone, 1-(9-octadecenyl)-	27.964	3.346	42.1
12	Sulfurous acid	11.942	0.671	4.2
	Sample II - Co (on) 6			
1	3,4-Hexanediol, 2,5-dimethyl-	3.479	1.452	38.0
2	1-Nonen-4-ol	4.074	2.911	35.8
3	Silone, cyclohexyldimethoxymethyl-	6.93	0.567	85.8
4	Undecane, 2,5-dimethyl-	7.655	0.581	24.0
5	n-Hexadecanoic acid	21.526	1.027	55.8
6	1-(+)-Ascorbic acid 2,6-dihexadecanoate	21.526	1.027	23.8
7	Octadecane, 3-ethyl-5-(2-ethylbutyl)-	24.407	0.724	20.5
8	2,2,4-Trimethyl-3-(3,8,12,16-tetramethyl-heptadeca-3,7,11,15-tetraenyl)-cyclohexane	26.403	1.237	19.2
9	Squalene	26.403	1.237	7.5

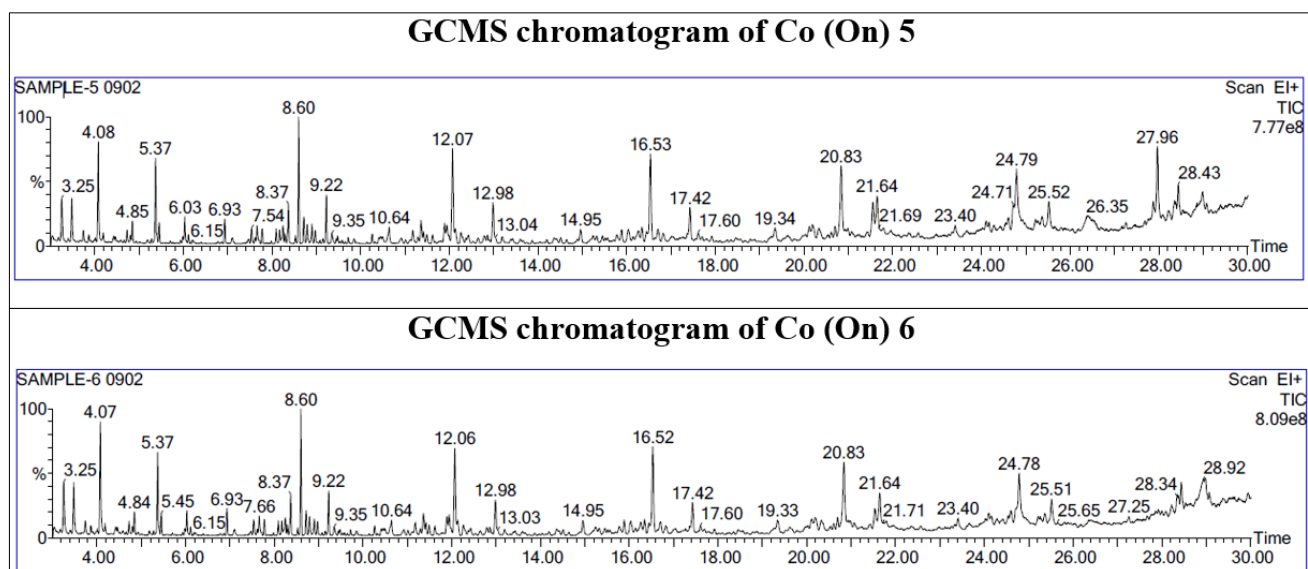


Fig 1: Chromatogram of Co (On) 5 and Co (On) 6

There were many metabolites eluted at different retention time in Co (On) 5 and Co (On) 6 and it was shortlisted to 12 in Co (On) 5 and 9 in Co (On) 6 respectively. In that, few elements were eluted in common in both the varieties. For instance, squalene, is an organic compound eluted in both the varieties at the retention time of 26.4 min. It is a triterpenoid, reduces cholesterol and triglyceride levels and act as an intermediate for the biosynthesis of phytosterol in plants. There is reported evidence for the elution of squalene at 44.108 min in the Vilathikulam (O3) onion variety [11] and obvious that, onion is good to reduce the cholesterol level. It is also evident from the studies that, drinking onion juice could markedly suppress cholesterol level and elevate total antioxidant capacity [12].

The aforementioned type of phytochemicals includes the elution of carboxylic acid esters, sugar derivatives, sulphur compounds, vitamin C, terpenoids, and saturated fatty acids and so on. In both Co (On) 5 and Co (On), palmitic acid was eluted at the retention time of 21.5 min. In general, palmitic acid supports the skin health and exhibiting the anti-inflammatory effects. The fatty acid profile of aggregatum onion reported that, onion seed contains saturated, mono unsaturated and polyunsaturated fatty acids. The fatty acids, palmitic and stearic acid exist in onion seed at a ratio of 7.23% (cv. Guntan moru), 12.2% (cv. Kantartpu3), 2.01% (cv. Guntan moru), and 3.74% (cv. Kantartpu3), respectively [13]. The palmitic acid level is higher than the 6.4-7.1% was also reported [14]. Further, onion is rich in ascorbic acid and dietary fiber. Ascorbic acid is one of the most powerful antioxidant that scavenges harmful free radicals and other Reactive Oxygen Species [15]. The ascorbic acid content in Co (On) 5 was reported as 8.07 mg/g [16].

Conclusion

Onion is a multipurpose vegetable and used as an ingredient in many dishes. It has numerous bioactive compounds, some of which act as antioxidants. The study focused on the screening of metabolites in aggregatum onion varieties viz., Co (On) 5 and Co (On) 6 of Tamil Nadu. Based on the results, it can be concluded that, many volatile and non-volatile compounds eluted from these onion varieties are highly beneficial to the mankind.

Conflict of interest: There is no conflict of interest.

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