



**CHEMICAL COMPOSITION, MINERAL AND NUTRITIONAL  
VALUE OF *DATURA METEL* SEED**

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**ABSTRACT**

In the past few decades there has been an exponential growth in the field of herbal medicine to be a better option for their healthcare needs, owing to their natural origin and reduced side effects. *Datura* spp. is one of the 50 fundamental herbs used in traditional medicine. The dry flower, particularly the violet coloured, if rolled and used like cigar, will help to relieve the asthma or wheezing like symptoms. The physico-chemical properties, mineral contents, fatty acid profile of oil were analysed. The % yield of the seed was 14.72%, the crude protein content of seed was 20.73%. *Datura metel* seeds contains rich phosphorous (690.2mg/100gm) and calcium (174.0 mg/100gm). *Datura* oil contains high % of linoleic acid (55.11%). This work conclude that *Datura metel* seeds have being potential sources of fixed oil which might be used for medicinal and other industrial applications.

**KEYWORDS:** *Datura metel* seed, oil %, GC-MS, metal analysis, AAS.



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## INTRODUCTION

*Datura metel* Linn. is distributed on the hills throughout India up to an altitude of 2600m and is common in North-Western Himalayas<sup>1,2</sup>. belonging to family Solanaceae. *D.metel* includes 85 genera and about 2,800 species in the world. There are approximately 25 different species of *Datura* throughout the world, they are often called as Jimson weed or 'Thomapple'. The name *Datura* comes from the early Sanskrit *Dustura*<sup>3</sup> or dahatura. *Datura* is referred to an ancient Indian literature as Shivashehara because the flowers are believed to be associated with Lord Shiva. Common names of *Datura* are numerous, some of the most common were nightshade Thronapple, Stinkweed, Devil's apple, Jimson weed and angel'strumpet<sup>4,5</sup>. It is native to Asia and Africa, widely cultivated and naturalized in tropic. It occurs throughout India in waste Place<sup>6</sup>, frequent on waste and along roadsides<sup>7</sup>. *Datura* are herbaceous, leafy annuals approximately 2 meters in height. The leaves are alternate, 10-20cm long and 5-18cm broad. The flowers are erect or spreading, trumpet shaped, 5-20cm long and 4-12cm broad at the mouth, colours vary from white to yellow, pink and pale purple, fruit is a spiny capsule 4-10cm long and 2-6cm broad, splitting open when ripe to release the numerous seeds. The whole plant is antiseptic, narcotic, sedative and is useful for asthma<sup>6</sup>, leaves narcotic and antispasmodic<sup>8</sup>. *Datura* is fascinating topic, while being limited in its uses economically, the alkaloids content of the plant have Present investigation was carried out for the qualitative and quantitative analysis of *D.metel* seed oil.

## MATERIALS AND METHODS

### (i) Collections of seeds

The seeds of *D. metel* were collected from the Dugadda forest region near Kotdwara in Garhwal (Uttarakhand, India) Latitude. 29.75°, Longitude. 78.53°. Dried fruits were collected in the polythene bags and brought to the laboratory. The voucher specimens were

identified and authenticated by Dr.H.B. Singh, National Institute Of Science Communication and Information Resources, New Delhi, India. Seeds were separated from the fruitpod and stored in airtight amber coloured glass bottles and kept in a refrigerator prior to analysis.

### (ii) Extraction of seed oil

A known weight of the seeds were grounded into powder form with high speed blender and dried in an air circulating oven at 50°C for 1 hr. Oil was extracted from the dried grounded seeds with petroleum ether (boiling point 60-80°C) using a Soxhlet extractor. The solvent was distilled off at 80°C and dried over anhydrous sodium sulphate. Oil content was calculated from the weight of oil and weight of seeds.

### (iii) Phytochemical analysis of seed oil<sup>9-12</sup>

Moisture, crude protein, fat content, carbohydrates, crude fiber, total sugar, reducing sugar, non reducing sugar, were estimated by AOAC (1990)<sup>13</sup> method. Nitrogen content estimated by the Kjeldal method and was converted to protein content by using the conversion factor 6.25. Carbohydrates estimated by using Fehling solution. Total ash, acid insoluble ash, water soluble ash, phenol, tannin and total alkaloids were carried out by Ayurvedic Pharmacopoeia of India<sup>14</sup>. For oil analysis, a known weight of the seed were grounded in powder and extracted with petroleum ether (boiling range 40-60°C) for 6-8 hours in a soxhlet apparatus. The extracted Petroleum ether was dried over anhydrous sodium sulphate and concentrated under reduced pressure by rotary evaporator. The oil percentage was calculated by weight difference. Density of extracted oil was determined picnometrically, Refractive index was determined at 25°C with Abbe refractrometer, viscosity was determined by Ostwald Method<sup>15</sup>. The oil extracted from the seeds was analysed for various chemical properties e.g. Acid value,

Saponification value, Iodine value, Unsaponifiable matter content by AOAC methods. Phytochemicals e.g. Alkaloids, Tannins and Total phenolics are analysed by Ayurvedic Pharmacopoeia<sup>14</sup>.

#### **(iv) Determination of metal/ mineral compositions**

The metal composition Zinc, Iron, Copper of the sample seeds was determined using an Atomic Absorption Spectrophotometer (Model no. – Varian 240FS+GTA120), after acid digestion. Calcium and magnesium was determined by complexometric titration with 0.1M EDTA using Erichrome black T indicator and calculated, phosphorus was determined by the precipitation and then titration method using the reagent ammonium molybdate and after filtration precipitate dissolved in 0.1M NaOH and titrate with 0.1M HCl by using indicator Phenolphthalein<sup>16</sup>. Sodium and potassium was determined by flame Photometer (model No. ESICO 1381) by using the reference standard (Merck) and calculated on the basis of reading and dilution of the sample.

#### **(v) Gas Chromatography Analysis (GC)**

The Fatty acids were derivatized by using the bron trifluoride method as described by Hisil<sup>17</sup>. Samples were injected as 2 µl into a Nucon model 5700 equipped with 10% DEGS (Diethylene Glycol Succinate) + 1% H<sub>3</sub>PO<sub>4</sub> constant phase, a flame ionization detector (FID) and chromosorb G (100/120 mesh) support matter, internal diameter (2mm) and stainless steel (190 cm) column. Column temperature was programmed from 70°C to 200°C with the increasing rate of temperature 6°C/Minute. Injector and detector temperatures were set at 225°C. Nitrogen (N<sub>2</sub>) (25 ml/min) was used as the carrier gas. Hydrogen (40ml/min) and Air (60ml/min) were used as burnt and dry gas respectively. Fatty acid methyl esters were identified by comparison with fatty acid internal standards, Individual fatty acid concentration was expressed as percent.

#### **(vi) Gas Chromatography/mass spectrometry Analysis (GC/MS)<sup>18,19</sup>**

Derivatized fatty acids methyl esters were analysed by using a Shimadzu GC-2010 equipped with a Shimadzu GCMS-QP2010 Plus mass selective detector having HP- MS capillary column (30m x 0.25mm, film thickness 0.25 µm). The initial column oven temperature was 140°C, programmed at 4°C/min to final oven temperature 240°C and held for 10 min at this temperature, injector temperature was 270°C. Helium was used as carrier gas with column flow rate 1.21 ml/min and the split ratio 1:20. For GC/MS detection, an electron ionization system with ionization energy of 70eV was used, Ion source temperature was 230°C and Interface temperature was 280°C. The components were identified by comparing their relative retention times and mass spectra with those of standards (main components), wiley 8 library data of the main system.

## **RESULTS**

Seed represents a condensed form of life and is a characteristic of phenograms. The chemical constituents of seeds are responsible for their medical properties. Seeds contains reserved foods like crude fat, crude protein, carbohydrates and different specific secondary metabolites (Total phenolics, tannins, alkaloids) together contribute to the biological activity of seeds. Proximate analysis of *Datura metel* seed oil were given in Table 1. It contains protein 20.73%, Carbohydrates 51.22%, % yield of the seed is 14.72%. Secondary metabolites (phytochemicals) were given in Table 2, these results shows that *Datura metel* seeds can be use a source of medicinally active natural products other than fixed oils and fatty acids, is traditional, contemporary medicine. Presence of phenolic compounds in oil supports for the antioxidant and antimicrobial activities. *Datura metel* seed are a good source of alkaloids (3.56%) and already used in medicine like CNS depressant, in bronchial asthma, cough, cerebral excitement. *datura metel* seed oil can be used for curing of many other chronic

disease causes by free radicles generate in metabolic process and produce adverse effect on human health by RNA/DNA damage, Cell wall damage, Protein synthesis interruption. Table 3 presents the data on mineral contents

of *Datura* oil, which shows that it is rich in Calcium, Phosphorous, magnesium, Iron which makes it valuable source of these minerals and can be used for making medicines.

**Table-1**  
***Proximate analysis of Datura metel seed***

S.no.	Chemical Test	Result
1	% Yield(Total Fat),	14.72
2	Carbohydrate content , %	51.22
3	Protein content, %	20.73
4	Moisture content, %	4.63
5	Ash content, %	5.14
6	Water soluble matter , %	49.36
7	Alcohol soluble matter, %	26.93
8	Acid insoluble ash ,%	3.52
9	Crude Fiber , %	7.35
10	Total Sugar, %	5.63
11	Reducing sugar,%	2.65
12	Non reducing sugar, %	2.98
13	Water insoluble ash %	15.62
14	Alcohol insoluble ash %	26.99

**Table-2**  
***Phytochemical content of Datura metel seed***

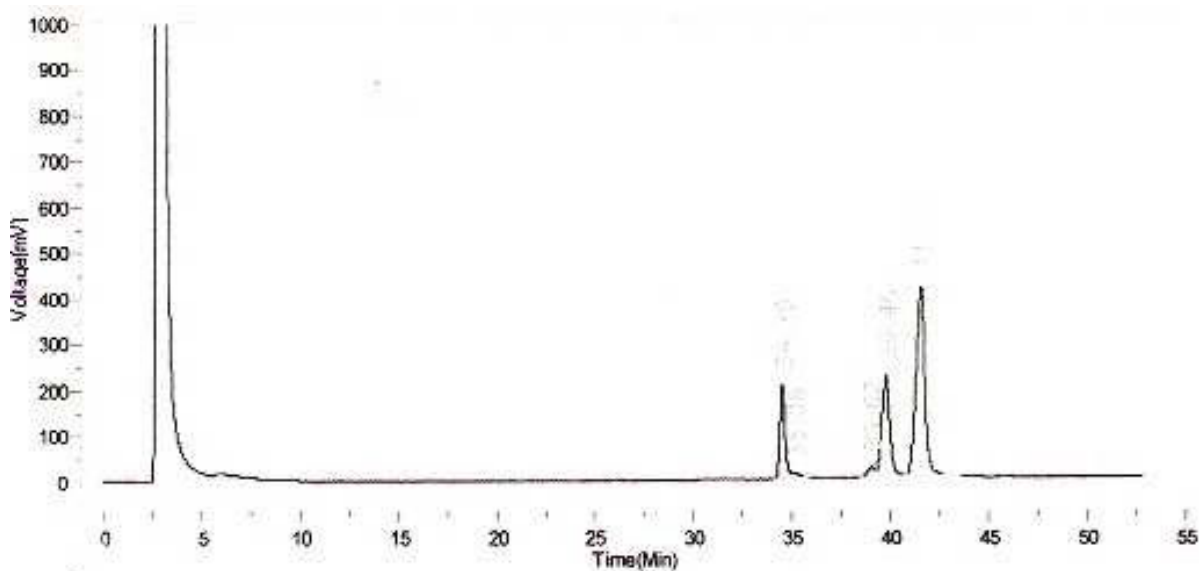
S. no.	Phytochemical contents	Result
1	Total alkaloid content, %	3.56
2	Total phenol content, %	0.35
3	Total tannin content, %	0.69

**Table-3**  
***Metal / Minerals contents of Datura metel seed (mg/100gm) dry weights***

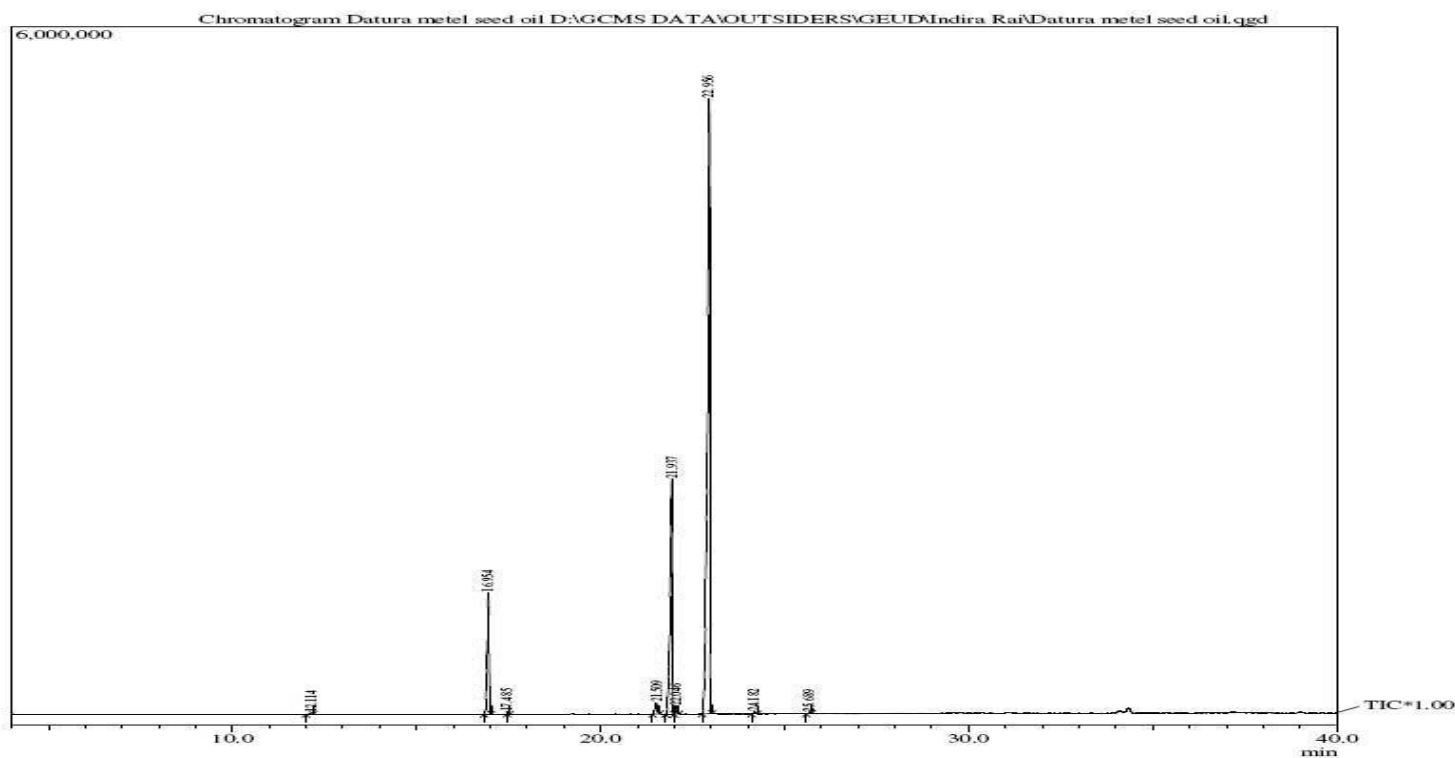
S.no.	Metal/Minerals	Result
1	Calcium(Ca)	174.0
2	Phosphorous(P)	690.2
3	Potassium (K)	0.50
4	Sodium(Na)	0.085
5	Iron(Fe)	16.8
6	Zinc(Zn)	2.63
7	Copper(Cu)	6.9
8	Magnesium(Mg)	390

**Table-4**  
**Physico-chemical properties of *Datura metel* seed oil**

S.no.	Chemical properties	Result
1	State at room temperature	liquid
2	Colour	yellow
3	Refractive index (at 40°C)	1.4511
4	Specific gravity (at 25°C)	0.8919
5	Acid value (mgKOH/gm)	4.10
6	Iodine Value	112.0
7	Unsaponifiable matter %w/w	0.49
8	Saponification value	215.6
9	Fatty acid profile	
10	Palmitic acid(C16:0)	15.7155
11	Stearic acid (C18:0)	2.0954
12	Oleic acid(C18:1)	26.1325
13	Linoleic acid(C18:2)	55.1102
14	Palmitoleic acid (C16:1)	0.9465
15	Total saturated %	17.8109
16	Total Unsaturated %	82.1892
17	Monounsaturated %	27.079
18	Polyunsaturated %	55.1102
19	Trans fat %	Not detected



**Gas chromatogram of fatty acid profile of *Datura Metel* seed oil**



Peak Report TIC

Peak#	R. Time	Area	Area%	Name
1	12.114	25150	0.07	Pentadecanoic acid, 14-methyl-, methyl ester
2	16.954	3962193	10.64	n-Hexadecanoic acid, methyl ester
3	17.485	43012	0.12	9-Hexadecenoic acid (Z)
4	21.509	471702	1.27	Octadecanoic acid, methyl ester
5	21.937	8769678	23.56	9-Octadecenoic acid (Z)-, methyl ester
6	22.046	231513	0.62	13-Docosenoic acid, methyl ester
7	22.956	23651826	63.53	9,12-Octadecadienoic acid (Z,Z), methyl ester
8	24.182	44279	0.12	9,12,15-Octadecatrienoic acid (Z,Z,Z), methyl ester
9	25.689	30427	0.08	Hexanoic acid, 4-methyl-, methyl ester
		37229780	100.00	

### GC-MS Chromatogram of *Datura metel* seed oil

## DISCUSSION

Oil extracted from seed is yellow in colour, free from sediments and having agreeable odour, it is liquid at room temperature like other conventional edible and commercial used oils. Moisture percentage of oil is 4.63, it should be stored for a long time. Physico-chemical properties of *Datura metel* seed oil is given in Table 4 and that properties are comparable with some conventionally used oils previously reported<sup>20,21</sup>. Acid value is an indicator for

edibility of oil and suitability for industrial use. Seed oil of *Datura metel* has acid value 4.10, falls within the recommended codex of 0.6 and 10 for virgin and non-virgin edible oils and fats<sup>22</sup> nearest to other conventional oils, which are already in use for edible and commercial industries. Iodine value of *datura* oil is (112), very closer to *mustard oil*(108), *cotton seed oil* (108) reported in Nutritive value of Indian food<sup>20</sup>. Non drying liquid oils have iodine values of

approx. 80-120 , Drying oils have greater than 150 and Semi – drying oils have an iodine value in the range of 120-150. *Datura* oil lies in the category of non drying oils. The non-drying oils find a wide variety of industrial uses: they enter into soaps and cleansers, cosmetics, lubricants, leather dressings, and candles. They are used in the processes of wool manufacture, especially carding; they are employed in making tin plate and in foundry work. Saponification value of *Datura metel* seed oil is 215.6, which suggests that the oils contain high molecular weight fatty acids and low level of impurities, so it can be used in soap making industry<sup>23</sup>. Physiologically fixed oils are emollients and demulcents and have nutritional value, Unsaturated fatty acid, namely linoleic (C18:2), linolenic (C18:3), arachidonic acids (C20:1) are termed essential fatty acids, as they are not produced in the human body and must be provided in the diet , fatty acid profile of oil shows high percentage of linoleic acid (55.11), that is comparable with *sunflower* seed oil ( total unsaturated fatty acid acids in oil is (82.19). Unsaturated fatty acids (polyunsaturated) help

to reduce cholesterol formation or deposition and hence to decrease the risks of atherosclerosis and other heart disease<sup>24,25,26</sup>.

## CONCLUSION

The present study shows in point of view for nutritional and commercial purpose *Datura metel* oil is very interesting oil, with low content of saturated and high content of unsaturated fatty acids and is favourable in commercial use in different industries given above and also in human health, because fatty acids, minerals, secondary metabolites, protein, fiber contents in particular seed have a very important effect on health. Many of the physico-chemical properties of *Datura metel* seed oil studied have very close similarity with other conventionally used oils. The present study provides as baseline data to develop seed oil for both domestic as well as industrial purposes. Ancient history shows that this plant can be utilized to cure number of diseases.

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