Available online on 15.06.2020 at http://jddtonline.info

Journal of Drug Delivery and Therapeutics

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Comparative Biological Activity Profile of *Nava* (Freshly Collected) and *Purana* (Old) *Dhanyaka* (*Coriandrum sativum* Linn.) through Gas Chromatography and *In-Vitro* Anti-Microbial Study

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ABSTRACT

Introduction: *Dhanyaka(Coriandrum sativum* Linn.) belonging to family *Apiaceae* is one such common aromatic edible herb, the fruits of which are used as *carminative, antimicrobial and cooling*. Classical texts of *Ayurveda* advocate these fruits to be used in old condition. With this background, a study was done to compare biological activity profile of Nava and *Purana Dhanyaka*(*Coriandrum sativum* Linn.) through, Gas chromatography and in-vitro anti-microbial activity. **Materials and methods:** Fresh fruits of *Dhanyaka(Coriandrum sativum* Linn.) were collected from Rona, Gadag district and authenticated. The fresh fruits named as **S1** with which essential oil extracted using clevengers apparatus. Few fruits were kept in an air tight container and stored for one year, and at the end of a year named as sample(**S_2**), essential oil extracted and stored. Both samples were subjected for GC and in-vitro antimicrobial activity. **Results and Discussion:** The Essential oil of *Nava Dhanyaka*(**S_1**) included 17 identified compounds which was dominated by monoterpenes and sesquiterpene; whereas ***S_2*** showed 6 identified compounds in which 3 constituents *isoborneol, citronellyl acetate* and *geraniol* were new findings. In-vitro anti-microbial study of essential oil extract showed that *Purana Dhanyaka*(S_2) had better efficacy with respect to the standard against the strain *Escherichia coli* and *Candida albicans;* whereas that of *Nava Dhanyaka*(S_1) against only one bacterial strain ie., *Streptococcus pyogens.* **Conclusion:** Preservation of *Dhanyaka(Coriandrum sativum* Linn.) showed biological changes in terms of antimicrobial activity compared to fresh sample.

Key words: *Dhanyaka, Coriandrum sativum* Linn., Gas chromatography, In-vitro antimicrobial study

Article Info: Received 21 March 2020; Review Completed 28 April 2020; Accepted 11 May 2020; Available online 15 June 2020

Cite this article as:

Chaithra, Mallya SV, Prabhu S, Comparative Biological Activity Profile of *Nava* (Freshly Collected) and *Purana* (Old) *Dhanyaka* (*Coriandrum sativum* Linn.) through Gas Chromatography and *In-Vitro* Anti-Microbial Study, Journal of Drug Delivery and Therapeutics. 2020; 10(3-s):12-16 http://dx.doi.org/10.22270/jddt.v10i3-s.4060

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INTRODUCTION:

Traditional knowledge on herbs, their potential therapeutic effect was well known among people, also documented in classical text books of Ayurveda. Few they used directly from plant, few parts advised to use after drying, other after special processing, the main aim to get target therapeutic effect through hidden metabolites of these natural products[1]. *Dhanyaka(Coriandrum sativum* Linn.) belonging to family *Apiaceae* is a common aromatic edible herb, the fruits of which are used as *Ahara* and *Oushadha* in many therapeutic conditions[2]. The whole plant, as well as the fruits are used in the preparation of many formulations having therapeutic efficacy in *trishna, Krimiroga, Daha, Mutravikara* etc[3]. The fruits are to be preserved for a period of 1year and to be used for medicine. *Adamalla* explains that keeping certain drugs for period of one year can be taken as purana dravya and it increases the potency of the drug.[4]

Biological activity shown by different herbal drug depend on its chemical constituents[5]. Essential oils extracts are the products from the secondary metabolism of plants that have applications in ethno-medicine, food flavouring, food preservation, cosmetics and pharmaceutical industries.[6] *Dhanyaka (Coriandrum sativum* Linn.) has been known to have abundant essential oil which has antimicrobial properties[7].

Hence with above all mentioned facts, a research plan has been designed to investigate chemical constituents of fresh and old sample of *Dhanyaka (Coriandrum sativum* Linn.) through Gas chromatography, and to evaluate the anti-

microbial activity of Nava And *Purana Dhanyaka* (*Coriandrum sativum* Linn.) through In-Vitro method.

MATERIALS AND METHOD:

Sample collection:

Matured whole fruits of *Dhanyaka(Coriandrum sativum* Linn.) were collected from the Rona, Gadag district, authenticated and voucher specimen deposited at department of Pharmaceutical Chemistry and Pharmacognosy, SDM Centre for research in Ayurveda and Allied sciences, Udupi(V/No.18060103).The fresh fruits named as **S1** with which essential oil extracted using clevengers apparatus[8]. Few fruits were kept in an air tight container and stored for one year, and at the end of a year named as sample(**S_2**), essential oil extracted and stored. Both samples were subjected for GC and in-vitro antimicrobial activity.

Gas chromatography

Methodology:

Volatile oil in the drug was estimated by distilling the 500g of coarsely powdered fruits of *Coriandrum sativum* Linn. with a mixture of 800ml of water, taken in a round bottom flask and connected to the Clevenger's apparatus and distillation was carried out. Volume of the essential oil was measured and sent for the Gas Chromatography study[9]. Methylated test sample was introduced into a stream of helium. The results were tabulated as per the retention time.

In-vitro antimicrobial study

Methodology:

The In-vitro Antimicrobial study is performed using well diffusion method[10]. Agar media was inoculated with loop of desired microorganism (Table 2). Test was conducted for different concentrations of extract at 10, 25, 50 and 80µl and kept for incubation. The presence of zone of inhibition was observed on petridish with respect to standard drug.

Table 1: Microorganism strains used

Microorganism strain	Code	Standard used
Staphylococcus aureus	MTCC 3160	Ampicillin
Streptococcus pyogens	MTCC-86	Ampicillin
Escherichia coli	MTCC-42	Ampicillin
Candida albicans	MTCC- 183	Clotrimazole

OBSERVATION AND RESULT

Gas chromatography

The fruits of *Nava Dhanyaka (Coriandrum sativum* Linn.) S_1 yielded about 0.7ml of yellow coloured essential oil with pleasant aroma. The GC-MS analysis of the fruits showed presence of totally 40 compounds in which 17 compounds were identified by comparing their Mass Spectra with MS library. The fruits of *Purana Dhanyaka (Coriandrum sativum* Linn.) S_2 yielded about 0.5ml of colourless essential oil with pleasant aroma. The GC-MS analysis of the fruits showed presence of totally 18 compounds in which 6 compounds were identified by comparing their Mass Spectra with MS library. Comparative essential oil composition of *Nava (S_1)* and *Purana Dhanyaka*(S_2) (*Coriandrum sativum* Linn.) are given in Table 1, Figure 1.

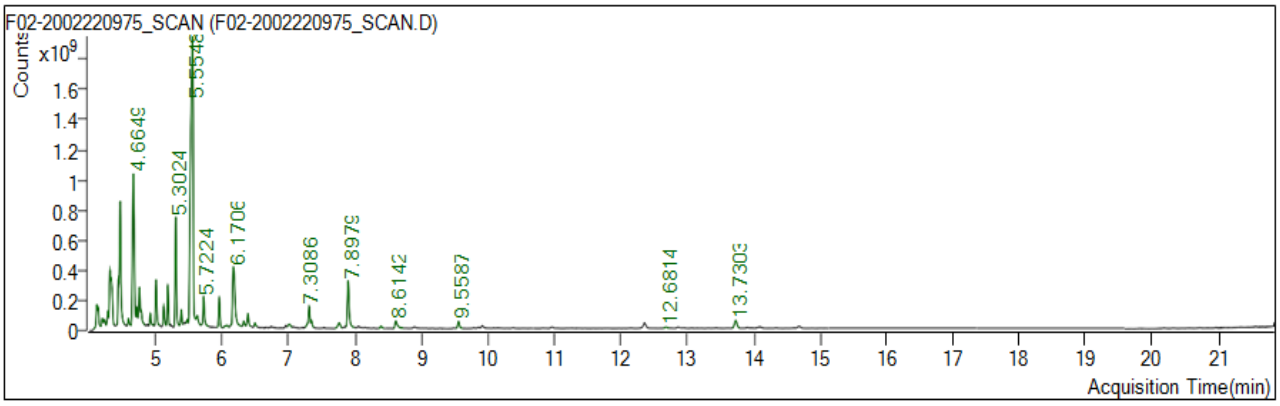

Figure 1: Gas chromatography of Essential oil *Nava Dhanyaka(Coriandrum sativum* Linn.) (S_1)

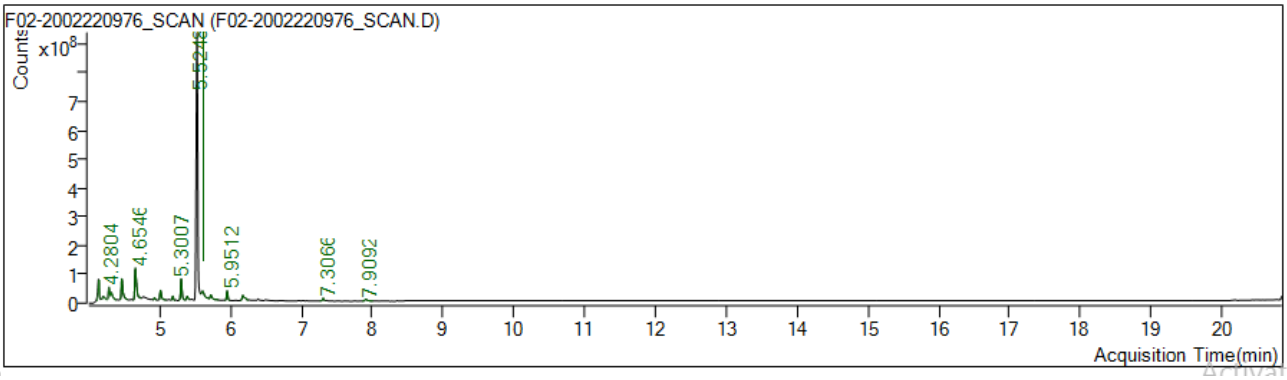

Figure 2: Gas chromatography of Essential oil of *Purana Dhanyaka(Coriandrum sativum* Linn.) (S_2)

Table 2: Essential oil composition of *Nava (S1)* and *Purana(*S2) *Dhanyaka(Coriandrum sativum* Linn.)

Phytochemical constituents	S1	S2
Bicyclo[2.2.1]heptan-2-ol, 1,7,7-trimethyl-, (1S-endo)-	-	+
alpha.-Terpineol	+	-
Decanal	+	-
Bicyclo[3.1.1]hept-3-en-2-one, 4,6,6-trimethyl	+	-
Geraniol	-	+
Citronellol	+	+
2,6-Octadien-1-ol, 3,7-dimethyl-(Z)	+	-
1-Decanol	+	-
Undecanal	+	-
trans-Geranic acid methyl ester	+	-
Myrtenyl acetate	+	-
6-Octen-1-ol, 3,7-dimethyl-, acetate	-	+
3,7-Dimethyloct-6-enyl ethyl carbonate	+	-
2,6-Octadien-1-ol, 3,7-dimethyl-, acetate, (Z)-	+	+
Dodecanal	+	-
Bicyclo[5.2.0]nonane,2-methylene-4,8,8-trimethyl-4-vinyl-	+	+
(E)-Hexadec-2-enal	+	-
Caryophyllene oxide	+	-
2-Hexadecenal(Z)	+	-
2-Pentadecanone, 6,10,14-trimethyl-	+	-

In-vitro antimicrobial study

Zone of inhibition of essential oil extract of *Nava* (S1) and *Purana* (S2) *Dhanyaka* (Coriandrum sativum Linn.) against *Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes and Candida albicans*is displayed in Table 3,4,5 and 6 respectively.

Table 3: Zone of inhibition of *Nava* (S1) and *Purana* (S2) *Dhanyaka* (*Coriandrum sativum* Linn.) against *Escherichia coli*

Sample	Volumes	S1 - Zone of inhibition(Radius in mm)	S2 - Zone of inhibition (Radius in mm)
Essential oil extract	10 µl	0	0
	20 µl	0	0
	50 µl	5	8
	80 µl	6	9
Control (DW)	50 µl	0	0
Standard (*Ampicillin*)	30 µg	10	11

Table 4: Zone of inhibition of *Nava* (S1) and *Purana* (S2) *Dhanyaka* (*Coriandrum sativum* Linn.) against *Staphylococcus aureus*

Sample	Volume	S1 - Zone of inhibition(Radius in mm)	S2 - Zone of inhibition(Radius in mm)
Essential oil extract	10 µl	5	0
	20 µl	6	0
	50 µl	8	0
	80 µl	9	6
Control (DW)	50 µl	0	0
Standard (*Ampicillin*)	30 µg	8	8

Table 5: Zone of inhibition of *Nava* (S_1) and *Purana* (S_2) Dhanyaka (*Coriandrum sativum* Linn.) against *Streptococcus pyogenes*is

Sample	Volumes	S_1 - Zone of inhibition(Radius in mm)	S_2 - Zone of inhibition(Radius in mm)
Essential oil extract	10 µl	5	0
	20 µl	6	0
	50 µl	7	0
	80 µl	8	6
Control (DW)	50 µl	0	0
Standard (*Ampicillin*)	30 µg	15	20

Table 6: Zone of inhibition of *Nava* (S_1) and *Purana* (S_2) *Dhanyaka (Coriandrum sativum* Linn.) Against *Candida albicans*

Sample	Volumes	S_1 - Zone of inhibition(Radius in mm)	S_2 - Zone of inhibition(Radius in mm)
Essential oil extract	10 µl	12	0
	20 µl	13	11
	50 µl	15	12
	80 µl	15	13
Control (DW)	50 µl	0	0
Standard (*Clotrimazole*)	30 µg	10	8

DISCUSSION:

Herbal drugs are seat of various active principle, proper collection time, preservation, processing decide its biological activity[11]. *Dhanyaka* (*Coriandrum sativum* Linn.) the dried fruits of which are used in medicine, which are said to be antimicrobial, appetizers, cooling. Fruits said to contain various phytochemical constituents with rich essential oil content. Classical texts of Ayurveda, advices them to use after a year[4]. Gas chromatographic studies and anti-microbial study of *Nava* (fresh) and *Purana* (after 1 year) *Dhanyaka* (*Coriandrum sativum* Linn.) will help us to evaluate biological changes in a drug after preserving for a year.

The Essential oil of *Nava Dhanyaka* included 17 identified compounds which was dominated by monoterpenes like *Terpineol, Verbenone, citronellol,* acyclic monoterpenes like *Methyl geranate, Myrtenyl acetate*, sesquiterpene like *Caryophyllene oxide*. *Terpineol* is a common ingredient in perfumes, cosmetics and is abundantly used as a flavouring agent[12]. *α-terpineol* has application in therapeutics due to its anti-oxidant, anti-ulcer and insecticidal properties. *Verbenone, Methyl geranate*, *Myrtenyl acetate*give a pleasant characteristic aroma. It also has anti-microbial properties[13]. *Citronellol* is also used as an anti-infective agent in many conditions[14]. The major aldehydes identified were *Decanal, Undecanal*, *1-Decanol* and *Dodecanal*. *Decanal* is used in foods as a flavouring agent and also has anti-fungal property[15].

The essential oil of *Purana(old)Dhanyaka(C. Sativum)* showed 6 identified compounds in which 3 constituents *isoborneol, citronellyl acetate* and *geraniol* were specifically identified in *Purana Dhanyaka.*

Isoborneol is extensively used as a food additive. It has camphor like aroma and is also used in insect repellants. It is used as a potential anti-viral agent and has anti-microbial, anti-tumour properties. *Citronellyl acetate* has potential larvicidal, bactericidal and fungicidal properties. *Geraniol* is one of the major constituent of *Coriandrum sativum* Linn. responsible for characteristic aroma. Along with being used as a flavouring agent, it is used as antibacterial, antifungal[17].

In-vitro anti-microbial study of essential oil extract showed that *Purana Dhanyaka*(S_2) had better efficacy with respect to the standard against the strain *Escherichia coli* and *Candida albicans.* The essential oil extract of *Nava Dhanyaka*(S_1) had better efficacy with respect to the standard against only one bacterial strain ie., *Streptococcus pyogens.*

CONCLUSION:

Preserving certain crude drugs will make changes among biological activity by the influence of time, environmental factors, climatic changes etc and also brings about changes in the arrangement, structure and phyto-constituents of the crude drug. *Dhanyaka(Coriandrum sativum* Linn.) the fruits which advised to use in medicine after an year were evaluated for thier phyto-constituents and anti-bacterial activity after preserving for a period of an year and has shown significant results. This study gives us a better understanding of rationality behind the effect of collection and preservation of a crude drug and its impact on phyto-chemical constituents, pharmacotherapeutic actions.

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