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Preface

We would like to present, with great pleasure, the inaugural volume-8, Issue-3, March 2022, of a scholarly journal, *International Journal of Engineering Research & Science*. This journal is part of the AD Publications series in the field of Engineering, Mathematics, Physics, Chemistry and science Research Development, and is devoted to the gamut of Engineering and Science issues, from theoretical aspects to application-dependent studies and the validation of emerging technologies.

This journal was envisioned and founded to represent the growing needs of Engineering and Science as an emerging and increasingly vital field, now widely recognized as an integral part of scientific and technical investigations. Its mission is to become a voice of the Engineering and Science community, addressing researchers and practitioners in below areas

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Each article in this issue provides an example of a concrete industrial application or a case study of the presented methodology to amplify the impact of the contribution. We are very thankful to everybody within that community who supported the idea of creating a new Research with IJOER. We are certain that this issue will be followed by many others, reporting new developments in the Engineering and Science field. This issue would not have been possible without the great support of the Reviewer, Editorial Board members and also with our Advisory Board Members, and we would like to express our sincere thanks to all of them. We would also like to express our gratitude to the editorial staff of AD Publications, who supported us at every stage of the project. It is our hope that this fine collection of articles will be a valuable resource for *IJOER* readers and will stimulate further research into the vibrant area of Engineering and Science Research.



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The Phytochemical Analysis and Amino Acid Profile of *Allium CEPA* (Onions) Extracts

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Abstract— It has been established that plants which naturally synthesize and accumulate some secondary metabolites such as alkaloids, glycosides, tannins, volatile oil, minerals and vitamins have medicinal properties. Then phytochemical and amino acid profile of *Allium cepa* extracts was carried out.

The proximate values of the nutrients in 100g of raw onion were analyzed using qualitative and quantitative method. Amino acid profile of the onion extracts was done by extraction, digestion, distillation, hydrolysis, titration, and evaporation techniques and finally analysed using Technicon Sequential Multisample analyser (DNA model). The standard quantitative method of analysis was used to determine the phytochemicals (toxicants) in the onion extracts while qualitative method was used for the screening.. The result of proximate compositions proved that onions contain Water (86.5%), carbohydrate (11.1%), Protein (1.3%), Fats and oil (0.2%) and Ash (0.5%). The Amino acid profile revealed that Arginine (3.74g/100g) and Histidine (1.21g/100g) were present in the extracts. Others include; Isoleucine (2.22g/100g), Leucine (4.11g/100g), Lysine (3.60g/100g) Methionine (0.86g/100g), Phenylalanine (2.29g/100g), Threonine (1.25g/100g) and valine (2.01g/100g), in 100g of protein. There was a change in the values of amino acid profiles of the aqueous extract when compared with that of solvent extracts. The results of the phytochemical screening showed that; flavonoid, terpenoids, carbohydrate, cardiac glycosides, saponins, anthraquinone, phlobatannins, alkaloid and polyphenol were present. The amounts of toxicants in 100g raw onion were: Alkaloid (13.0%), Tannic acid (0.03g), Oxalate (1.15g), Cyanogenic glycosides (2.91mg) and phytic acid (6.05mg). likewise the solvent extracts. But at alpha – level ($p \geq 0.05$), there was no significant difference ($p = 0.222$) between the effects of aqueous and solvent extracts. The research has shown that; onions widely used as food, could serve as natural medicine, flavour enhancer and antimicrobial agent in food and pharmaceutical industries to improve Nigeria's ailing economy.

Keywords— *Allium cepa*, Amino acid, phytochemical screening.

I. INTRODUCTION

The history of herbal medicine dated back to 2800BC (Gerber, 2010). Medicinal herbs contain substances that can be used for therapeutic purposes and synthesis of useful drugs. Meanwhile, plants that possess therapeutic properties or exert beneficial pharmacological effects on the body of animals are generally termed “Medicinal plants” (Tapsell *et al.*, 2006; Giovannimi *et al.*, 2016). They have no specific morphological characteristic but possess some special qualities that make them medically important. It has been established that plants which naturally synthesize and accumulate some secondary metabolites such as alkaloids, glycosides, tannins, volatile oil, minerals and vitamins have medicinal properties (Edeoga and Erratodo, 2000; Benkeblia, 2004).

Allium cepa (Onions) is one of the edible species of a large genus (*Allium*) consisting of more than 700 species (Burnie *et al.*, 1999). Among the edible *Allium*, the onion (*Allium cepa*) ranks first in the warm-temperate hills of eastern Nepal, followed by garlic (*Allium sativum*) and shallot (*Allium cepa* Aggregatum group) (Gautam *et al.*, 1997). *Allium cepa* belongs to the family of *Liliaceae*. It is also known as ‘garden onion’ or ‘bulb’ onion (Indu, 2017). It is one of the oldest cultivated

vegetables in history. *Allium cepa* is a tunicated bulb, round, and oblong in shape, invested with a shining, thin, dry membrane, of a reddish or white colour (Azu *et al.*, 2007). It contains Carbohydrate, Protein, Fats, minerals and Vitamins (Vamshi *et al.*, 2010). Onion contains amino acids, which are very important elements for nearly all physiological functions. The “essential” amino acids are called “*essential*” because our bodies can’t produce them; therefore, it’s *essential* that they are included in our daily diet (Amino acid, 2017).

Onions are effective against common cold, heart disease, diabetes, osteoporosis (Wetli *et al.*, 2004), cough and sore throat (Ye, *et al.*, 2013; Augusti, 1996). This could be due to certain chemical compounds believed to have anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties present in onions (Ye, *et al.*, 2013; Slimestad *et al.*, 2007).

Major active antibacterial components of onion in-vivo are the allicin derived organo-sulphur compounds (Tsao and Yin, 2001).

Onion has been used in many societies against bacterial and fungal infections in folk medicine. It could be used as natural preservative in foods to control microbial growth due to the antimicrobial activities onion possesses (Pszczola, 2002). Different Onions extracts differ in their antimicrobial activities, and micro-organisms vary in their responsiveness to the bioactive compounds of the extracts (Gorinstain *et al.*, 2010). The development of antibiotic resistance has become a global public health challenge which is causing ineffectiveness of antibacterial agents leading to increase in rate of morbidity and mortality. Therefore this research intends to assess the phytochemicals and amino acids present in *allium cepa* (onions) extracts to justify the claims on its use in folk medicine.

II. MATERIALS AND METHODS

2.1 Collection of Plant Material

The Onion bulbs (*Allium cepa*) were obtained from a Fruit and Vegetable Market in Owerri and transported to the applied microbiology laboratory of Nnamdi Azikiwe University Awka for analysis according to W. H. O. (2003) guidelines on good agricultural and collection practices (GACP) for medicinal plants.

2.2 Cold Water Extraction

By using Hander, (2005) method of extraction, the moisture of the onion bulb was removed by drying sliced onions inside an air-oven at 40°C.

It was pulverized using electronic blender, and ten (10.0g) of the pulverized sample dissolved in 100mls distilled water.

It was sterilized at 121°C for 15 minutes, left to soak for 2 days after which it was filtered aseptically, concentrated and stored at 4°C for analysis.

2.3 Hot Water Extraction

By using Hander, (2005) method of extraction, the moisture content of onions was removed by drying sliced onions in oven at 40°C. The sample was pulverized using electronic blender, mixed with sterile distilled water in a ratio of 1:20 (100 g in 1 L solvent).

It was stirred and heated for 4 hours.

After cooling, the extract was filtered aseptically, concentrated and stored at 4°C for analysis.

2.4 Soxhlet Extraction

The peeled, sliced onions were dried in an oven at 40°C, and then pulverized using electronic blender to a fine powder, stored at 4°C for use.

By adopting Hander, (2005) method of extraction. The onion sample was extracted using ethanol solvent at a solute – solvent ratio of 1:10 for 6 hours in a Soxhlet extractor.

The Crude extract was kept in a sample bottle and stored at 4°C prior to analysis.

The process was also repeated for petroleum ether solvent.

2.5 Proximate Compositions of the Onions

The Nutrient composition of the aqueous extract were determined using the modified method described by Onwuka, (2005).

2.6 Amino Acid Profile

The Amino acid profile of Onions extracts was determined by using the methods described by Benitez (1989), Hander, (2005) and AOAC (2006).

2.7 Quantitative Determination of Phytochemicals

The phytochemicals were quantitatively determined by adopting Olajide *et al.*, (2011) and Onwuka (2005) methods of analysis.

2.8 Phytochemical Screening

The phytochemical screening of the extracts was done using standard qualitative procedure according to Harbone (1995).

III. RESULTS AND DISCUSSIONS

The results of the Proximate analysis of the onion, Amino acid profile of the onions extracts, quantitative analysis of the toxicants, Phytochemical Screening of the Onions extracts were presented in the Figures and Tables below.

TABLE 1
THE PROXIMATE COMPOSITIONS OF ONIONS EXTRACTS PER 100G OF EDIBLE PORTION

Food Nutrients	Percentage Compositions
Carbohydrate	11.1%
Moisture	86.5%
Protein	1.3%
Fat	0.2%
Ash	0.5%
Crude Fibre	0.4%

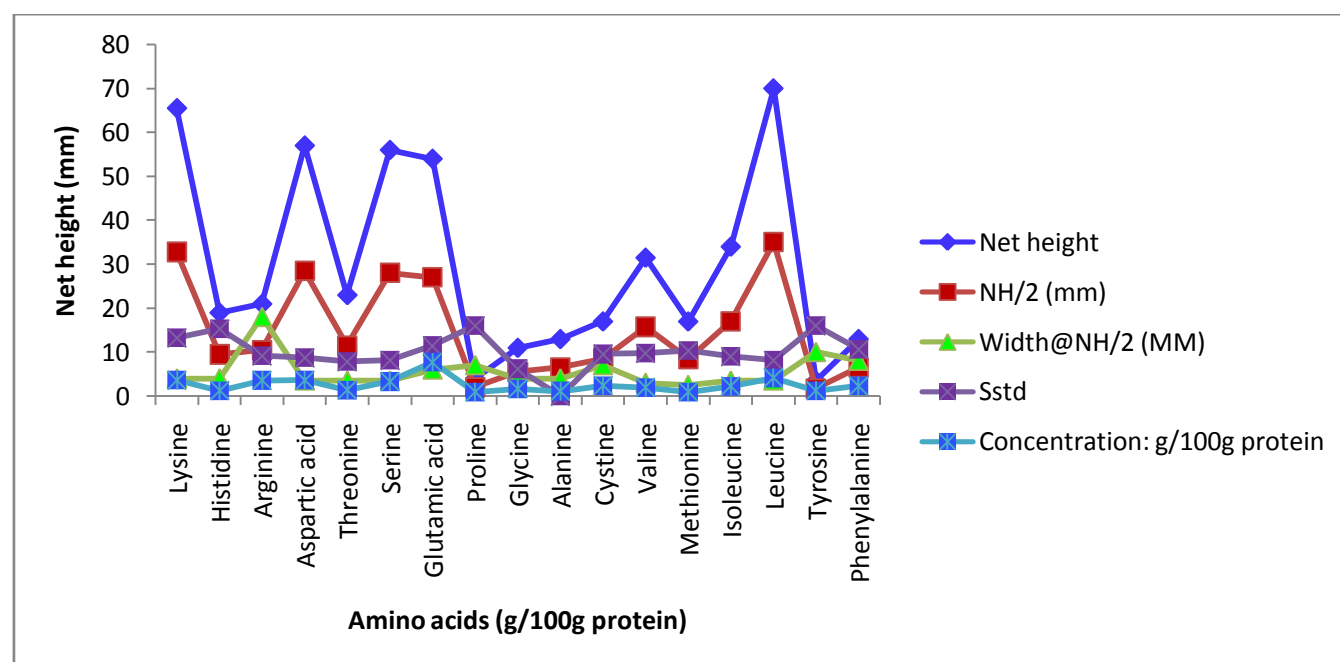


FIGURE 1: The amino acid profiles of *Allium cepa* (onion) cold water extract

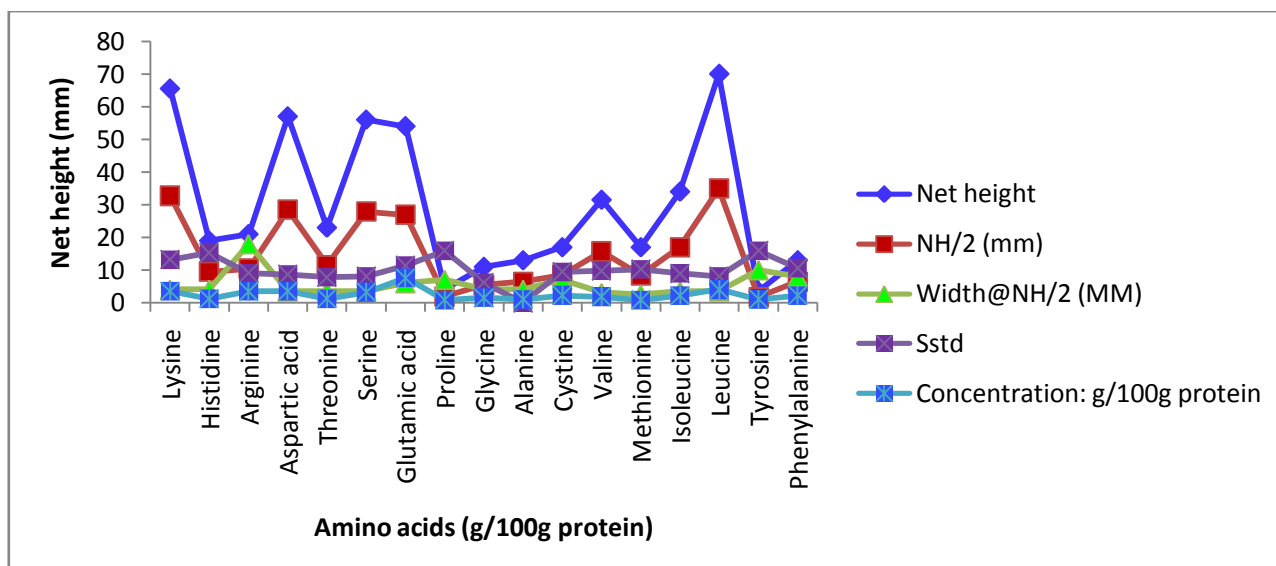
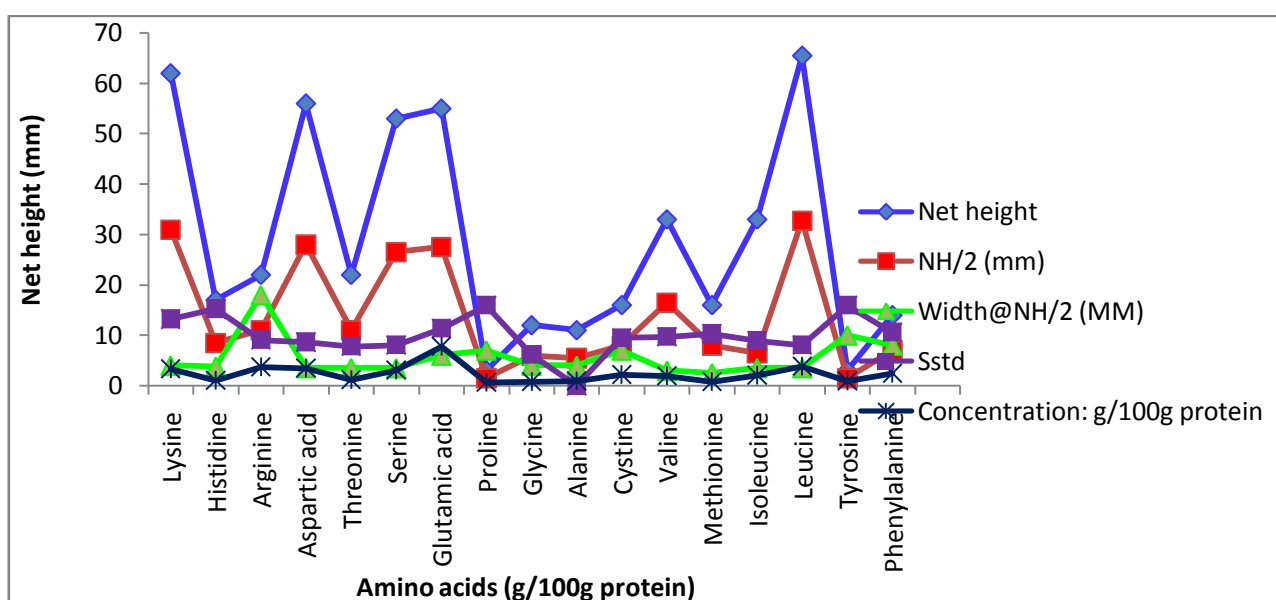
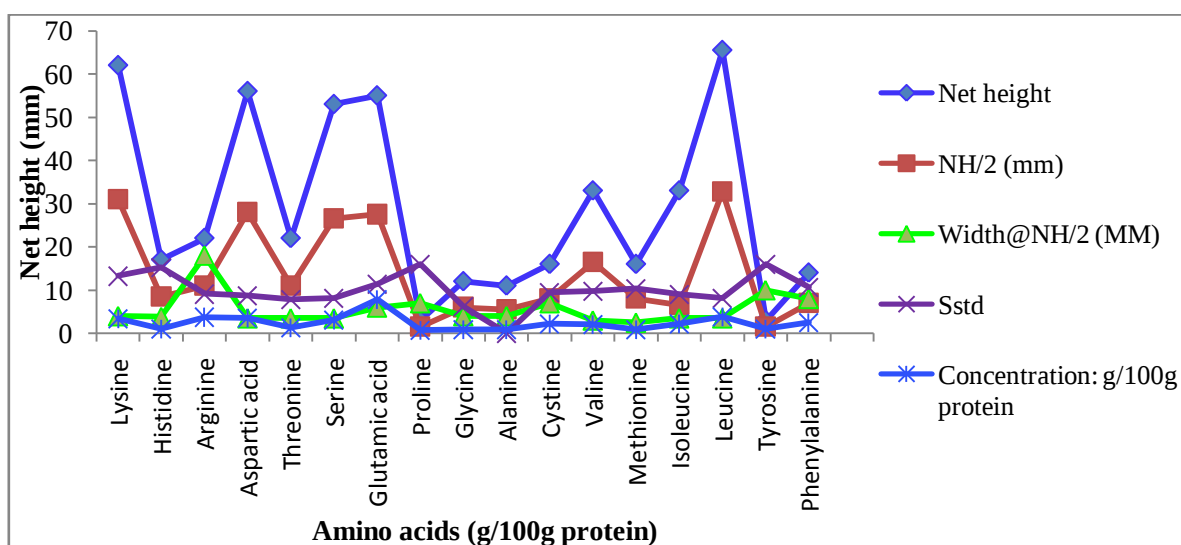
FIGURE 2: The amino acid profiles of *Allium cepa* (onion) hot water extractFIGURE 3: The amino acid profiles of *Allium cepa* (onion) ethanolic extractFIGURE 4: The amino acid profiles of *Allium cepa* (onion) Petroleum ether extract

TABLE 2
THE TOXICANTS (PHYTOCHEMICALS) IN ONIONS

Oxalate (g/100g)	Tannin (g/100g)	Phytic acid (mg/100g)	% Alkaloids	Cyanogenic glycosides (mg/100g)	Sample
1.78	0.06	7.33	15.11	3.79	A
1.27	0.05	7.01	15.32	3.51	B
1.15	0.03	6.05	13.03	2.91	C
1.20	0.04	6.08	13.06	3.01	D

Key: A=Ethanol extract, B=Pet. Ether extract, C=Cold Water Extract, D= Hot water extract

TABLE 3
PHYTOCHEMICALS SCREENED IN *ALLIUM CEPA* (ONION) EXTRACTS

Class of Compounds	Cold Water Extract	Hot Water Extract	Ethanol extract	Pet. Ether Extract
Alkaloids	-	-	+	+
Flavonoids	+++	+++	+++	+++
Tannins	+	+	+	+
Saponin	+	+	+	+
Terpenoid	++	++	+	+
Glycosides	++	++	+	+
Steroids	+	++	+	+
Phlobatannin	+	++	+	+
Polyphenols	++	+++	++	++
Antraquinone	-	-	+	+
Anthranoid	-	-	-	+
Glucose	++	++	++	++

Key: + = Presence; - = Absence

IV. DISCUSSIONS

The presence of fibre as shown in the proximate compositions (Table 1.0) which are non digestible ingredients fermented by bifidobacteria help in maintaining the health of the gut and colon. Table 1.0, also shows that Onion contains some minerals elements and vitamin C, and this makes it important in human nutrition (FAO, 2011; Robertson *et al.*, 1991).

The results of the amino acid profiles of the onions extracts (Figure 1.0 to 4.0), shows the presence of Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine and valine as the essential amino acids (Anonymous, 2007), Tryptophan was destroyed by 6N HCl during processing of the sample (hydrolysis). Arginine is regarded as an essential and non essential amino acid. Other non essential amino acids present in the onion extracts include: aspartic acid, serine, glutamic acid, proline, glycine, alanine, cystine and tyrosine (Anonymous, 2007).

Histidine is unique because it is both essential and non essential amino acid. The bodies of living organisms needs histidine to develop and maintain healthy tissues, especially myeline sheath of nervous cells to ensure the transmission of messages from the brain to organs throughout the body (Anonymous, 2007). Isoleucine is another branched-chain amino acid that cannot be produced in the body and must be obtained from the food we eat. It is essential for proper blood clotting and muscle repair. This implies that the result of the amino acid profiles of this research has been in agreement with the *antithrombotic effects of onion* (Bordia *et al.*, 1996).

The symptoms of isoleucine deficiency include; dizziness, fatigue, headaches, confusion and depression. Isoleucine plays important role in the transport of oxygen from the lungs to the various parts of the body and the production of hemoglobin, which contains iron. Isoleucine is also important for the efficient metabolism of glucose and boosts the body's energy levels. The result of this research is therefore in line with the *antidiabetic effects of onion* (El-Demerdash, *et al.*, 2005). When given orally, isoleucine reduces the level of sugar in the blood by 20 percent and increases sugar absorption in the muscles by 71 percent without actually increasing the level of insulin in the blood (Anonymous, 2007).

Lysine is a key component in hormones and enzymes and plays a vital role in the production of collagen, a substance that is critical in bone, muscle, cartilage, and skin formation. Lysine plays a key role in calcium absorption by reducing the amount of calcium being excreted in the urine. It promotes the growth of hair, nails, teeth, and bones. The result of the amino acid, Lysine therefore supports the work of Muhlbauer *et al.*, (2002), that onions have *bone strengthening properties*.

Phenylalanine present in the onion extracts (Figure 1.0 to 4.0) is regarded as a forerunner of tyrosine, the anti-depressant dopamine, norepinephrine, epinephrine and the skin pigment, melanin. Eating foods rich in phenylalanine will help to prevent mood swings which help one out of lethargy, sluggishness, feeling of low morale and anxiety (Anonymous, 2017).

The amino acid, Threonine found in the onion extracts is important in the formation of bones, cartilage, hair, teeth and nails. It is also responsible for the growth and development of liver muscles, skeletal muscles and the small intestines. Threonines also help in the production of antibodies to strengthen the immune system. It is mostly found in the nervous system and help to fight depression. It helps speed the healing of wounds and recovery from injury by helping build strong bones. These showed that the results of amino acid profile of the onion extracts have been in agreement with the anti-inflammatory and bone strengthening properties of onion (Sparg *et al.*, 2004; Matheson *et al.*, 2009). There were differences in the values of amino acid profiles of the aqueous extract and that of the solvent extracts.

The result of other phytochemicals in Table 3.0 shows that Flavonoids and Organosulfur compounds are the two major classes of secondary metabolites in Onion. Alkaloid was absent in the aqueous extract of the Onion sample. This could be due to the insolubility of alkaloid in water.

The major flavonoid found in onion is quercetin, present in conjugated form, as quercetin 40-O- β -glycopyranoside, quercetin 3,40-O- β -diglycopyranoside, and quercetin 3,7,40-O- β - triglycopyranoside (Sellappan and Akoh, 2002; Koncic and Jug, 2011). The quercetrin, act as anti-bowel disease (Yoshida *et al.*, 1998a), enhances immune system activity like cold and fevers, mouth and pharynx inflammation, infections, bronchitis/cough, hypertension, dyspepsia and arteriosclerosis (Dorant *et al.*, 1996). The extract could be applied on wounds and stings, on the skin, to remove warts and even unwanted skin blemishes (Lai and Roy, 2004). This ability could be due to the presence of flavonoid and other organosulfur compounds in Onion which act to scavenge oxidizing agents that inhibit the oxidation of fatty acids, thereby preventing the formation of pro-inflammatory messengers and also inhibit bacterial growth (Zohri *et al.*, 1995; Kim, 1997).

Phenolic compounds present in the onion extract (Table 3.0) are potentially toxic to the growth and development of pathogens (Edeoga *et al.*, 2000). The oxidation inhibiting activity of tannins in onions could be attributed to their Gallic and digallic acids (Edeoga *et al.*, 2000).

Saponins present in the extract (Table 3.0), justify the use of onion in treatment of gastrointestinal tract disturbances by traditional healers (Sampath *et al.*, 2010). Saponins also have anti-inflammatory activity and this could account for the application of onion extract on wounds and stings on the skin by traditional medicine practitioners (Sparg *et al.*, 2004). It fights against cancer by helping the cell DNA to stop producing bad cells and make only good ones (Yuan, *et al.*, 2008).

Steroids present in the onion extracts (Table 3.0), are used as starting materials in the synthesis of hormonal drugs, and this could support the reason for its use (Onion) to increase libido and strengthening of reproductive organs (Sampath *et al.*, 2010).

Onion contains toxicants (phytochemicals) although in small quantity as shown in Table 2.0, which implies that; individuals are not allowed to consume more than 10 bulbs (approximately 105g) of raw onion per day due to presence of cyanogenic glycoside, phytic acids and Tannic acid in them to avoid mouth and body odour (Banerjee *et al.*, 2003).

V. CONCLUSION

This study has shown that the efficacy of the extracts might be due to presence of bioactive constituents in Onion. These bioactive molecules are potential sources of antimicrobial drugs that could tackle the problem of drugs resistance that is currently a challenge to our country's Food and Medical industries.

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Study on a Proactive Approach towards Environment Management in Oil and Gas Industry

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Abstract— Managing Environmental Risk for onshore Oil and Gas exploration and production is a challenging task because many drilling and other techniques are complex in this industry. In this it is described the implementation and the use of environmental risk management and mitigation strategies for onshore oil and gas projects. To eliminate any risk of contamination the potential impact of the operations and identification of mitigation procedures are followed. It provides a framework for the future environmental management of the area in order to minimize the negative impacts of operations.

The extraction and transportation of both Oil and Natural Gas has a scope of important risks for both workers from these activities by accidents at work and people from neighboring villages (major accident) and for the environment. This paper describes the theoretical considerations regarding the implementation of concept of environmental risk in their activities in Oil and Gas industry and also emphasized on the aspects of managing environmental risk in Oil and Gas industry. Questionnaire survey was conducted for the senior level executives of all installations visited of ONGC, Western – Region and analysis was done in order to identify the environmental risk taking place in Oil and Gas industry and what are the safety measures taken into consideration for managing it.

Keywords— HSE Policy, Oil and Gas Standards, QHSE, EMS, PDCA Cycle.

I. INTRODUCTION

Oil and Gas industry operations occur round the globe, in diverse range of habitats and ecosystems. These operations often place enormous pressures on the local environment and inhabitants, and as global population growth continues to rise, so too does the demand for usable energy and resources. Since last decade, consumption and production increased for all fuel types, surpassing previously record high levels for all fuels except nuclear. For fossil fuels, global consumption rose further rapidly than overall production, resulting in a controlled production pressured for oil and gas companies. Meeting the rising global energy demand comes with higher risks and costs to both society and the environment. Oil and Gas companies thus face the challenge of meeting the world's expanding energy demand while minimizing the negative externalities associated with these operations. Oil and Natural Gas Corporation Limited (ONGC) continuously ensures care and protect for the environment. So, in 1983, ONGC exhibited dynamic environmental management through its integrated Health, Safety and Environment (HSE) Policy formulation. HSE policy is integrated in ONGC's vision and mission. ONGC incorporates a sturdy method of checking regular audit and management review of Quality Health Safety and Environment (QHSE) management system, policy and maps risks. For the initiation of any new project or modification within the existing project Environment Clearance is that the legal demand needed. The appliance of environmental clearance and a few study reports like Environmental Impact Assessment studies, Disaster Plans, etc. are submitted to The Ministry of Environment and Forests (MoEF). MoEF is the nodal agency within the body structure of the Central Government for planning, promotion, co-ordination, and overseeing the implementation of India's environmental and forestry policies, and programmes.

While there are both international and national regulations regarding best practices, many of the risks these corporations face are site specific, requiring detailed background research and precautionary measures that can't be solved by employing a generalized framework. To handle these concerns, Oil and Gas companies have to develop their risk management system and operational practices to attenuate harmful environmental impacts and incidents. By embedding environmental concerns into

all aspects of daily operations, these companies are able to do socially beneficial outcomes, while avoiding potential disasters and more stringent legislation.

1.1 Purpose of Study

The need for carrying this research is how we can control Environmental risks in Oil and Gas industry, and there are various approaches required for controlling the Environmental risks.

1.1.1 Approaches to Controlling Environmental Risks

- Review of regulatory and institutional framework to make sure that ONGC-Western Region is responsive to regulatory obligations and make compliance while undertaking project activities.
- Collate and analyze primary and secondary data on environmental components like meteorology, levels of pollution and coastal ecology, etc.
- Evaluate assess potential environmental impacts that may arise as a result of the project

As environmental issues become a more crucial concern of the global community, the increased pressure is put onto these energy companies to regulate practices in a way that minimizes threats to the environment.

To optimize the management of all aspects of ONGC's activities associated with the operations in the western onshore sector of ONGC. The EMP describes *inter alia* the actions in terms of:

- Regulations and Standards
- Best Practices and guidelines
- Local Environmental and Social Sensitivities
- International Conventions and National Policies.

1.2 Research Hypothesis

The impact of changes such as Physical, Chemical and Biological changes arising from interaction of drilling operations with environment are to be lighten by adopting industry rules and regulations, specific standards, guidelines and current regulatory requirements. Monitoring of environment helps in detecting changes in the environment resulting from discharges from oil & gas drilling operations. To address the adverse environmental impact of a project during its execution Environment Management Plan provides a delivery mechanism. It aims at mitigating potential impacts related with exploratory drilling activity based on baseline data.

1. Emissions and discharges from actual drilling operations
2. Blowout and Oil spill containment
3. Occupational Hazards

II. MATERIAL AND METHODS

2.1 Data Sources

Researcher visited various installations and drilling rigs of Western – onshore region, ONGC. Interactions with all installations manager, in-charges, representatives, senior managers, environmentalist and stakeholders etc. helped to gather information pertaining to my dissertation. The brief of the visit at some installations are mentioned further.

During the visit researcher has visited.

- Drilling rigs in Ahmedabad Asset.
- Fishing and Down hole Equipments Workshop
- Work-over rig, Ahmedabad Asset
- Group Gathering Station, Motera
- Group Gathering Station, Limbodhara

- Gas Collecting Station, Kalol
- Gas Compression Plant, Kalol
- Central Tank Farm, Kalol
- Water Injection Plant, Kalol
- Hydraulic Fracturing Field
- Desalter, Nawagaon
- Waste Water Treatment Plant.

2.2 Research Design

According to my dissertation topic the approach used is Deductive approach. In this approach the research done is based on scientific investigation. The researcher studies what others have done, reads existing theories of whatever situation he or she is studying, and then tests hypotheses that emerge from those theories. The research design researcher opted for this topic is survey questionnaire. Survey is associated with deductive approach. As the studies relates to management so the researcher chosen this strategy. Survey helped to collate huge amount of data from the installations researcher visited. The design of research is as follow:-

- Firstly, a questionnaire was prepared for survey.
- Visited/surveyed various installations at Ahmedabad Asset, ONGC.
- Interacted with senior level executives of particular installations.
- Discussed regarding the questionnaire and various techniques ongoing during the visit on the installations.
- Got filled the questionnaire by senior level executive at particular installations.
- Reviewed the feedback of the survey and it turned out to be useful and beneficial for the researcher.
- At last, analyzed all the feedbacks received through survey questions and summed up to one conclusion.

2.3 Air Environment

If sailing so close and downwind of the site during flaring will led to offshore receptors such as fishing vessels and commercial shipping which are unlikely to be exposed.

2.4 Data Analysis Procedures

According to the deductive approach, the procedure used for data analysis is descriptive analysis and plotting the pie chart.

III. FINDINGS AND ANALYSIS

The data collected from the questionnaire are as below:

Question 1: Are you aware of ONGC- HSE policy?

The finding was that all the senior level executives from all the installations are aware of ONGC – HSE policy.

Question 2: ONGC – HSE Policy is signed by.

The findings were that all the senior level executives were not aware of this. Only 40% people answered it correctly i.e. Chairman and Managing Director (CMD). Rest 10% answered Director on-shore and remaining 50% were not aware of it.

Question 3: Does your installation possess a valid certificate for integrated management system based on:

- ISO – 9001
- ISO – 14001
- OHSAS-18001

The finding was that all the senior level executives from all the installations confirmed that their installation possess a valid certificate for integrated management system based on ISO – 9001, ISO – 14001, OHSAS – 18001.

Question 4: Which ISO deals with Environment System?

According to the findings 60% senior executives are aware of ISO. They answered that for the requirement of environment management ONGC uses ISO – 14001 to enhance environmental performance. Rests 40% were not sure about it.

Question 5: Is your installations complying with regulatory requirements under Petroleum and Natural Gas rules?

The findings proved all the senior executives of all the installations were aware of Petroleum and Natural Gas rules i.e. PNG rules.

Question 6: Are your installations maintaining Risk Register – Corporate Risk Matrix.

According to the findings, 50% of senior executives were aware of risk register – corporate risk matrix and they are maintaining at their installation site. To further clarify they added it is a document used for risk management tool to fulfill regulatory compliance acting as a repository for all risks identified and also includes additional information about each risk, e.g. nature of risk, reference and owner, and mitigation measures. Further, Risk matrix is prepared to collect all the information accordingly. 30% of the executives had no idea about the maintenance of risk register and rests 20% were not aware.

Question 7: As an installation manager how do you handle any eventuality due to environment management?

According to the findings, 40% of the executives and installation manager said they use both, ISO – 14001, and Standard Operating Procedure (SOP) to handle any eventuality that takes place in managing environment. Further, they described SOP in detail that it is a set of written instructions that describes work involving hazardous materials (biological, chemical and radiological) are performed safely. 30% use only SOP at their installation and 30% use only ISO – 14001.

Question 9: What is the full form of EMS?

The findings shows, 80% wrote the full form correctly i.e. Environment Management System (EMS). They added it is a set of processes and practices that enable and organization to reduce its operating efficiency. 20% were aware of EMS but they wrote the full form wrong i.e. Environment Mitigation System.

Question 10: What is the full form of ISO?

The findings shows, 50% wrote the full form correctly i.e. International Organization of Standardization (ISO). They have a lot of information regarding ISO. 50% were not sure of ISO.

Question 11: What are the standards followed by ONGC in QHSE?

According to the findings, 70% filled all three standards, ISO – 14001, ISO – 9001, and OHSAS – 18001 are followed at the installations by ONGC in QHSE. 20% filled ISO 14001 and ISO 9001 are followed at their installation by ONGC and rest 10% filled ISO 14001 and OHSAS 18001 are followed at their installations.

Question 12: What do you mean by PDCA cycle according to Deming?

According to the findings, 20% of the executives are aware of Plan – Do – Check – Act (PDCA) cycle. PDCA cycle has no end and it is repeated again and again for continual improvement. It is considered a project planning tool. It is an iterative four step management method used in business for the control and continuous improvement of processes and products. It is also known as Deming cycle. 80% are not aware of PDCA cycle.

Question 13: What is the difference between continuous improvement and continual improvement with respect to QHSE management?

According to the findings, 30% are aware about the differences they added that continuous improvement approach is an uninterrupted flow which does not stop. In this approach one will constantly look to make improvements, it is a sustained process of development. Continuous improvement drives improvement in both processes and products. Whereas, continual improvement approach is repeated and has pauses in between repetitions. Another 40% were unaware of the differences and purposes. 20% of executives had knowledge about continuous improvement and 10% of senior executives know about continual improvement.

Question 14: What does ISO Standards provides among the following: Technological, Economical and Social benefits?

According to the survey data the findings are 80% filled all three are required for ISO standards. 10% had no idea and rest 10% filled technological and economical benefits.

Question 15: What do you mean by Generic Management System Standards?

The findings proved 10% people are aware of Generic management system standards. They explained it is applicable to any type of organization by addressing management discipline such as quality, environment, and energy or information security. These standards are widely adopted management system globally. 20% executives were not sure about it but still managed to explain it. 70% were unaware of this system.

Question 16: Does ISO carry any Certification. True or False

According to the findings, 30% of senior executives agreed that ISO does not carry any certification. 35% agreed that ISO requires certification. Rest 35% had no idea.

Question 17: EIA is basic tool for identifying Environmental Hazards. True or False

The findings showed, 80% of the senior executives agreed to the statement. Rest 20% does not agree because they are unaware of the EIA tool.

Question 18: What do you mean by Accreditation?

The findings showed, 20% know what accreditation means they explained the process or action of officially recognizing and giving approval. A national body which evaluates the competence of the certification. 80% are unaware of the term.

Question 19: What is Zone Zero?

According to the findings, 55% are aware of hazardous area classification. Zone zero comes in an area where inflammable atmosphere is continuously present for longer period of time. As a guide for zone 0, it can be defined as over 1000 hours/year or >10% of time. 45% had no idea about zone 0.

Question 20: What do you mean by Occupational health?

As per the findings, 90% filled it correctly. They filled it is a field of health care made up to multiple disciplines devoted to the safety and well being of employees in the workplace. 10% filled it they are aware of it but could explain it better.

As per the interactions with senior level executives during the visit all the analysis is done and further interpreted.

IV. RESULTS

As per the findings and analysis of the survey questionnaire, the interpretations of the above analysis are as below:-

- Oil and Gas companies faced with the challenge of meeting the world's expanding energy demand while minimizing the negative externalities associated with these operations.
- For minimizing the hazards in the environment, Oil and Gas Company regulate both national and international rules, standards and regulations.
- For the smooth management of environment, ONGC has prepared HSE policies and QHSE policies.
- To avoid potential disasters and more stringent legislation, these companies achieve beneficial outcomes by embedding environmental concerns into daily operation.
- Occupational health plays an important role for managing environmental risks, because health care of the employees is also must. If they are healthy than for sure they can manage the environment as well. Thus, this should be considered vital and needs to be practiced regularly.
- As per the analysis, most of them were unaware about hazardous area identification. Thus, more awareness should be created to the employees and all people so that they can distinguish and use the zones accurately.
- In addition to traditional risk based approaches like cost-benefit analyses, there are various other strategies companies can utilize to embed environmental considerations into daily operations.
- Companies have the option of encouraging employees in complying with corporate risk management strategies.

- Through annual publications and company statements on the importance of considering environmental threats from operations, the company can bring these concerns to the front of the employees' minds and to a top priority for operational awareness.
- As per the analysis, most of them were unaware about accreditation. So, according to the researcher, being part of any organization employees should have awareness about their company's approvals.
- Mostly, employees working in the company are not aware of EIA reports, EIA tools, TOR, GCCB and GPCB guidelines, consents and approvals, Emergency response plan, MoEF guidelines, OISD guidelines and site specific guidelines. Thus, awareness and usage should be increased in order to manage environmental risks.
- As most of the guidelines, standards are followed and kept in knowledge we can minimize the environmental risk in much better way.
- It is always better to inform shareholders and stakeholders. Advertising and public statements can help the company inform shareholders and stakeholders, consumers and the Government of their new Corporate Policies and Objectives.
- This Corporate transparency may help develop business relations if the company adheres to these promises, but this new prestige can also come at the cost of losing business if the Corporation fails to meet these explicitly stated standards.
- ONGC provides an exemplary case of the benefits that can be reaped from successfully developing an integrated environmental risk management.
- Generic management system standards should be followed by every company as it is applicable to any type of organization by addressing management discipline such as quality, environment, and energy or information security. Also, these standards are widely adopted management system globally.
- According to QHSE management, proper strategy should be applied in order to incorporate the usage of continual and continuous approach.
- Continual improvement approach should be taken into consideration as it improves both processes and products.
- Project planning tools such as PDCA cycle should be regulated regularly for continual improvement of the management and also clarifying the steps used are proper for improving of processes and products.
- All the standards ISO-14001, ISO – 9001 and OHSAS - 18001 are followed by ONGC in QHSE management.
- Standard Operating Procedure (SOP) should be used to handle any eventuality that takes place in managing environment. It is a set of written instructions that describes work involving hazardous materials (biological, chemical and radiological) are performed safely.
- Risk management tool like Risk Register – Corporate Risk Matrix, should be used to fulfill regulatory compliance acting as a repository for all risks identified and also includes additional information about each risk, e.g. nature of risk, reference and owner, and mitigation measures

V. CONCLUSION

Oil and gas companies often face extreme pressures to provide the world with its global energy needs while maintaining an excellent environmental performance record. While international and national regulations provide a partial solution to addressing global environmental threats from oil and gas exploration, production and refining activities, the degree of success of this legislation has been limited. As environmental issues become a more integral concern of the global community, the increased pressure is put onto these energy companies to adjust practices in a way that minimizes threats to the environment.

Companies like ONGC have found a way to successfully tackle the environmental issues associated with daily energy activities. By embedding environmental considerations into all units within and operations of the company, ONGC is able to focus employee attention on minimizing the probability of a detrimental incident. ONGC is further prepared because in the event that an environmental situation does arise, the internal emergency response team is knowledgeable of the operational risks and has a plan in place to alleviate the impacts as quickly and fully as possible. By creating an integrated risk management approach, ONGC is able to follow the objectives publicized to its employees and shareholders with the daily risk management approaches that are carried out by all member of the corporation. ONGC continues to excel in terms of its environmental performance as it now sets a company wise objective of having “zero incidents” occur at each operating unit.

While ONGC is just one player in the oil and gas industry, the continued success of its internal environmental risk management approaches has caused other large corporations to embrace similar objectives practices. ONGC follows all the statutory rules, regulations, standards and guidelines. ONGC uses various strategies such as EIA, TOR, MOEF guidelines, GPCB & CPCB consents, Site response plan, HSE & QHSE guidelines etc. to maintain the environmental risks. As more companies adopt systematic environmental analysis approaches, companies that have yet to adapt are pressured into compliance with these newly established voluntary standards. Ensuring compliance with voluntary standards within the oil and gas industry is much simple than globally enforcing and monitoring national and international regulations because companies are competing to efficiently produce energy while maintaining a positive environmental reputation. Companies that drive environmental regulations within the industry gain a competitive advantage over the other energy companies in the market.

While uncertainty is a major challenge with all risks pertaining to business operations, environmental risks pose some of the greatest threats to corporations. Even though the likelihood of an event is low, the consequences of an incident are extremely high. The occurrence of such an event has the ability to halt business production and thus extinguish revenue streams, brand image from negative publicity and increase the number of industry and making it challenging for the corporation to stay ahead of industry regulations. Therefore, addressing environmental concerns at early stages when prevention costs are low as opposed to dealing with the consequences and excessive fines after an event is critical for these large energy corporations to maintain a competitive edge in this industry. ONGC regulates environment clearance for the initiation of new project or modification in the existing project. ONGC follows PDCA cycle or Deming Cycle management method for the control and continuous improvement in products and processes. ONGC prioritize Environmental Protection as business functions. ONGC was successful in achieving QHSE certification for all the installations.

Embedding environmental considerations into daily operations may continue to be an effective route to dealing with the environmental risks associated with oil and gas operations. Energy companies will constantly face the challenge of minimizing environmental impacts while maximizing shareholder value and so have to adopt a process the effectively and efficiently enables them to try do both. Integrating environmental risk management processes into all aspects of oil and gas activities may be challenging for some corporations, but if these companies approach environmental risks in the same manner as other business risks and capital projects, then developing, implementing and enforcing a company specific management framework should not be a challenge. Although it is complicated to eliminate all risks affiliated with energy related activities, the addition of internal environmental risk management approaches with existing national and international regulations may prove to be an effective method for combating global environmental concerns.

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