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The Study on the Histopathological Changes of Stomach of *Channa punctatus (Bloch)*. By used Pesticide Endosulfan

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Abstract - The aquatic ecosystem is faced with the threat of biodiversity loss due to indiscriminate use of pesticides. Other than targeted pests, pesticides affect a wide range of non target organisms, such as invertebrates and fish inhabiting aquatic environment. The present study deals with the impact of endosulfan on histopathology of stomach of Channa punctatus Bloch. In the laboratory condition fishes are divided into control and experimental groups. The LC50 value of endosulfan for Channa punctatus Bloch. is calculated which is 0.0004ppm. For the experiment two concentrations are selected 0.0002ppm and 0.0004ppm and fishes are exposed for 24hrs, 48hrs, 72hrs, 96hrs. Fishes showed severe histological changes in Stomach. The degenerative changes included fused microvilli, the outer membrane of microvilli are broken, hemorrhage in the sub mucosa region, cells swelling, vacuoles are recorded in an increasing order towards the higher tested doses. This type of work can be helpful in understanding hazards of pesticides and pollution of pesticide by anthropogenic activity.

Keywords : *endosulfan, microvilli, vacuoles, hemorrhage, lc50.*

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The Study on the Histopathological Changes of Stomach of *Channa punctatus (Bloch.)* By used Pesticide Endosulfan

Kishor Haloi [α], Monikankana Kalita [σ] & Ramesh Nath [ρ]

Abstract - The aquatic ecosystem is faced with the threat of biodiversity loss due to indiscriminate use of pesticides. Other than targeted pests, pesticides affect a wide range of non target organisms, such as invertebrates and fish inhabiting aquatic environment. The present study deals with the impact of endosulfan on histopathology of stomach of *Channa punctatus* Bloch. In the laboratory condition fishes are divided into control and experimental groups. The LC50 value of endosulfan for *Channa punctatus* Bloch. is calculated which is 0.0004ppm. For the experiment two concentrations are selected 0.0002ppm and 0.0004ppm and fishes are exposed for 24hrs, 48hrs, 72hrs, 96hrs. Fishes showed severe histological changes in Stomach. The degenerative changes included fused microvilli, the outer membrane of microvilli are broken, hemorrhage in the sub mucosa region, cells swelling, vacuoles are recorded in an increasing order towards the higher tested doses. This type of work can be helpful in understanding hazards of pesticides and pollution of pesticide by anthropogenic activity.

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I. Introduction

Fishes are much vulnerable to their toxic substances and bioaccumulation cause serious risk to life. Such toxic substances enter to human through food chain, as fishes constitute an important part of animal protein in rural and urban areas. Alteration in the chemical composition of a natural aquatic environment, due to contact with hazardous substances like heavy metals, pesticides, and effluents from industries usually affect the behaviors, biochemistry, and physiology of the fauna including fish (M. Z. Vosyliene and N. Kazlauskiene, 1999). Fishes are one of the most precious natural resources on earth, and it creates a wide range of benefits to humans, including fisheries, wildlife, agriculture, urban, industrial, and social development .However, the unregulated release of agricultural chemicals especially pesticides into water bodies have caused environmental problems to all classes of organisms in the aquatic habitat. The aquatic ecosystem is faced with the threat of biodiversity loss due to indiscriminate use of pesticides. Other than targeted pests, pesticides affect a wide range of non target organisms, such as invertebrates and fish inhabiting aquatic environment (Pandey,1988). Agricultural runoff of rain and irrigation water introduces pesticides into the aquatic environment, where it poses significant toxicological risks to resident organisms (Kumari and Kumar, 1997). Pesticide pollution severely affects aquatic organisms and, in turn, the entire food chain including human beings (Dutta, Mawell 2003). Their availability and selectivity to toxic substances are main criteria for selection as an experimental animal. The present piece of work includes a detailed account of sub lethal effects of insecticides on the stomach and intestine of fresh water, air breathing, Indian murrel, *Channa punctatus* (Bloch), a commercially important fish, which is easily found in muddy shallow water, a good food fish of high nutrition as well as medicinal value. Since the intestinal tract is the first organ to come into contact with food-borne contaminants, ultra structural changes of these organs were chosen as criteria for the sub lethal action of endosulfan was selected for the study. Thus, the objective of this study was to investigate the lethal and sub lethal effects of endosulfan to *Channa punctatus* using mortality, behavioral and histopathological changes of Stomach. Changes in these parameters are being investigated as potential diagnostic tools in assessing the effects of endosulfan on fish with a view of setting up standards for safe disposal of wastes.

II. Materials and Methods

a) *Channa Punctatus (Bloch)*

Fishes are collected from local market and weights were taken on electric balance. The length and breadth were taken. The length ranges from 12-14 cm. Weight varies from 18 to 20g.The fishes were washed in 0.2% K_2MnO_4. The fishes were just dipped on 0.1% K_2MnO_4 for few seconds and taken out and again washed in normal water (Joshi et al., 2002). Before this the two aquariums are washed thoroughly in running tap water and filled with water. Stones are placed on the bottom of the aquarium and aquatic plants were placed. O_2-dissolver is also introduced and methylene blue is added and kept the aquarium to settle it for two days. Now ten (10) fishes were introduced in each of the aquarium and kept there for 10 days for acclimatization.

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Fishes were fed regularly with cut pieces of earth worm that were collected from neighboring areas.

Endosulfan (Thiodan Comercial Trade Product is used) is an organochlorine pesticide patented in the mid 1950s. Technical grade endosulfan is mainly composed of a mixture of two biologically active stereoisomer's named α-endosulfan and β-endosulfan in a ratio of 70 % to 30 % respectively. As minor impurities technical grade endosulfan may also contain up to 2 % endosulfan alcohol and 1 % endosulfan ether. Endosulfan was developed as a non-systemic insecticide with contact action, generally used in control of damage caused by aphids, ticks, mites and other insects on a broad range of crops and non crop vegetation such as cereals, maize, sorghum, oilseed crops, fruit, vegetables, olives, potatoes, cotton, tea, coffee, or ornamental plants. Endosulfan the commercial product Thiodan contains 39% of Endosulfan. To determined the LC_{50} value of Endosulfan on *Channa punctatus* prepared the following doses of Endosulfan .0001 ppm, .0002ppm,.0003ppm,. 0.0004ppm,.0005ppm,.0006ppm. By the help of the formula- $N_1V_1=N_2V_2$ here, N= Concentration V= Volume. After 10 days, in both of the aquaria two separate doses of Endosulfan 0.0002 and 0.0004 ppm were applied. After the day of exposure, fish samples were collected from of the aquarium in the interval of 24 hrs –i.e. 24 hr, 48 hr, 72hr, 96 hr. Fishes were observed throughout the period of experiment and recorded. As per the plan of the study, after acclimatization in laboratory condition, fishes are divided into two groups- Group-A- Normal: One group of fish is used as normal or control group. Experimental Group :Group-B= One group of fish is treated with 0.0002 ppm of endosulfan. Group-C= One group of fish is treated with 0.0004 ppm of endosulfan. Histological study was carried out following the standard procedure of (Gurr et al., 1968). Intestinal tissues were dissected out very carefully to avoid any damage from the three groups of fishes (normal group A, treated group B and treated group C). the sections are cut in 5 μm using a microtome. Stained sections were Examined under Bright field of Fluorescent microscope.

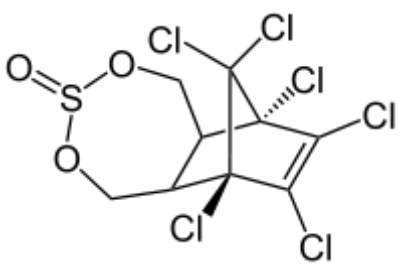

Figure1 : ENDOSULFAN(6,7,8,9,10,10hexachloro-1,5,5a,6,9,9a-hexahydro-6,9-methano-2,4,3-benzodioxathiepine-3-oxide)

Concentration	No.of Exposed	No.of Survived	No.of Responding
0.0001 ppm	10	10	0
0.0002 ppm	10	8	2
0.0003 ppm	10	8	2
0.0004 ppm	10	5	5
0.0005 ppm	10	3	7
0.0006 ppm	10	1	9
1 ppm	10	0 (only after 1 hr)	0

Figure 2 : Survived and mortality of *Channa punctatus (Bloch.)* exposure with Endosulfan

III. Result

Normal fishes that were kept for acclimatization exhibit a drastic behavioral changes after exposure to Endosulfan. In fact, no morphological alteration like change in scales, gills or skin, fin etc change were noticed, but of course the body become much slimy due to excess secretion of mucous. The normal fishes weighs about 22- 24 grams which were found to be reduced in treated groups. The cause of reduction of weight was found to be the stress condition due to stopping of food supply during the period of the present study. In both of the concentration 0.0002 PPM and 0.0004 PPM fishes exhibit a highly uncomfortable state. They tried to jump out from the water for breathing and irritation. Fishes lost their balances, float on water. Histopathological Studies. Summary of histopathological changes observed in the stomach tissues of *Channa punctatus*.subjected to sub lethal concentrations of 0.0002 PPM and 0.0004 PPM of Endosulfan for 24, 48,72,96 hrs are presented in the Figures below.

a) Control Stomach

The wall of the stomach was composed of mucosa, sub mucosa, muscularis and serosa. Intestinal mucosa was composed of the epithelial layer, the lamina propria and stratum compactum. Mucosal folds consisted of connective tissue cores covered by Intetinal epithelium. Columnar cells were the more numerous of the epithelial lining cells and closely resembled those of higher vertebrates. These tall and cylindrical cells had striated, free borders (brush border or microvilli) and contain oval nuclei which were situated either centrally or towards the bases of the cells. Stomach mucosa secreting cells or goblet cells were interspersed among the columnar cell being more numerous along the slides rather than on the crests or at bases of the mucosal folds.

b) Treated Stomach

i. *0.0002 PPM 24 Hrs Exposure with Endosulfan*

When the slides of .0002 PPM 24 Hrs were observed seen that fusion of stomach microvilli, aggregation of blood cells in the microvilli region as well as in the sub mucosa region. Formation vacuoles in sub

mucosa and microvilli region. Hemorrhage occurs in the sub mucosa region.

Irregularities of microvilli, aggregation of blood cells in the periphery of microvilli, vacuolation occurs in the microvilli region. The outer membrane of microvilli were breaken at some points. Vacuolation in sub mucosa layer.

iii. *0.0002 PPM 72 Hrs Exposure with Endosulfan*

Blood cells are aggregated in abundance in the sub mucosa and microvilli region. In flammation at the site of microvilli loss. Hypertrophy of the Intestinal microvilli. Large vacuoles were seen in the sub mucosa region.

iv. *0.0002 PPM 96 Hrs of Exposure with Endosulfan*

Fused microvilli were seen, vacuolation in the mucosa as well as in the sub mucosa. Appoptic cells are seen in the microvilli region.

v. *0.0004 PPM 24 Hrs Exposure with Endosulfan*

Aggregation of blood cells in the periphery of microvilli and sub mucosa region. Vacuolation seen in the sub mucosa region.

vi. *0.0004 PPM 48 Hrs Exposure with Endosulfan*

Large vacuolation seen in the sub mucosa. Cells swelling occurs, aggregation of blood cells, hemorrhage seen all over the sub mucosa region.

vii. *0.0004 PPM 72 Hrs Exposure with Endosulfan*

The breakage of the outer membrane of the microvilli. Large vacuoles are seen in the sub mucosa, Hemorrhage all over the surface, pigmentation in the different parts of the microvilli. Due to progressive cells loss narrower mucosa layer is seen compared to others.

viii. *0.0004 PPM 96 Hrs Exposure with Endosulfan*

Severe damage of microvilli occurs. The destruction of sub mucosa layer as well as vacuolation on it. Narrower mucosa layer, hemorrhage, inverted microvilli are seen.

IV. Discussion

Endosulfan induced pathogenicity in intestine and stomach may be due to the fact that organochloride in the presence of HCl secreted in the stomach forms organochloride acid, which has highly corrosive properties. This acid destroys mucous secreting cells of intestinal lining causing the observed abnormalities. Pathological gastrointestinal effects of endosulfan including damage to the mucosal lining, loss of microvilli, cracked clay appearance of duodenal mucosa and desquamated epithelial cells of gastric mucosa have also been observed by earlier workers. Hence causes irritation and destruction of the mucous membrane of the intestine, thereby hampering absorption. (Anderson, et al., 1969) It was suggested that lead increases the formation of gastric ulcers by interfering with the oxidative metabolism in the stomach that increased the incidence of gastric ulcer (Olaleye et al., 2007).

Histological examination revealed great variability in the intestinal lesions severity existed among most fish caught including focal deformation with necrosis of mucosal epithelial layer of some villi, enlargement of the intestinal villi due to vacuolar degeneration or cloudy swelling of the mucosal epithelial cells Lymphocytic infiltration, dissociation and reduction of muscular bundles and serosal lysis were also detected. In some instance, the columnar epithelial layer in between the intestine villi carry long hair like extensions and lymphatic sinuses and heavily cellular infiltration were detected in the intestinal tissue underlying. This may be represent important link in the intestinal immune system which catch antigen and pass it into macrophage and lymphocyte underlying it to activate immune responses against antigen (Ali, et al., 2008). According to (Bhatnagar *et al., 2007)* the observed irritation and destruction of the mucosa membrane of the intestine, hampering absorption. The pathological alterations in the observed by many investigators about the effects of different toxicants on fish intestine. Epithelial degeneration, inflammatory cells infiltration in the sub mucosa as well as sub mucosal edema was seen in the intestine of tilapia fish exposed to carbofuran. The implication of this is that lead causes an increase in the formation of free radicals, which, if not mopped up by free radical scavengers, will expose the stomach to inflammation and gastric mucosal damage. These adverse effects of lead as well as its inhibition of enzyme activities (Dai et al., 2009; Abdallah et al., 2010) might be the main inducer of the obtained intestinal histopathological damage of the exposed mollies. The Intestine is the first organ which is come into contact with food- borne contaminants (Braunbeck and Appelbaum, 1999). Mandal and Kulshrestha 1980 describe the lesion formation in villi of *Clarias batrachus* after exposure to sumithion. Histological analysis of Intestine tissue of *Channa striatus* and *Heteropneustes fossilis* inhabiting the polluted water showed degenerative changes in the serosa, mucosa and sub mucosal layers, necrosis, proliferation and desquap-mation of the superficial parts of the villi (Kumari and Kumar, 1997). Braunbeck and Appelbaum 1999, have also found that in the intestine, exposure of Endosulfan is associated with changes in the epithelial lining, which indicates disturbance of intestinal absorption. (Cengiz et al., 2001) reported edema, degeneration, accumulation of lymphocytes and eosinophils were reported in the Intestine of *G. affinis* exposed to Deltamethtin (Cengiz and Unlu, 2006).

V. Conclusion

Pesticides are the most hazardous substance that not only affects the target organism but also the non-target organisms. This can be said that the toxic

chemicals enter the food chain and causes bio-magnification in different strata of food chain. Although the pesticides are frequently used in the paddy fields to yield a higher production of crops, perhaps it acts as a silent killer that have a detrimental effect on environment, damaging and causing that to non-target organism. This type of study can suggest that the use of pesticide in the paddy field should be in a control rate which does not affect the non-target organism. Government has formulated several action plans but the need of the hour is that the people realize by themselves about the negative effects of the pesticides.

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Fig- Treated Stomach 10x Resolution .0002 PPM 72 Hrs A- Vacuolation B- Breakage Microvilli C- Thinner Serosa, Sub Mucosa

Fig-Treated Stomach 40x Resolution .0002 PPM 72 Hrs A- Aggregation of Blood Cells B- Vacuolation By Necrosis C- Cells Swealling

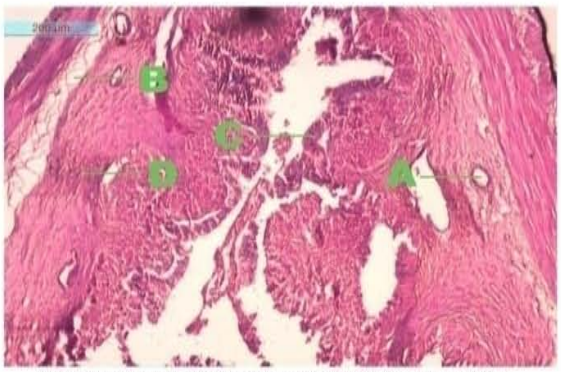

Fig- Treated Stomach 10x Resolution .0002 PPM 96 Hrs A- Vacuolation B- Damage Sub Mucosa C- Inverted Microvilli D- Shrinkage Tissue

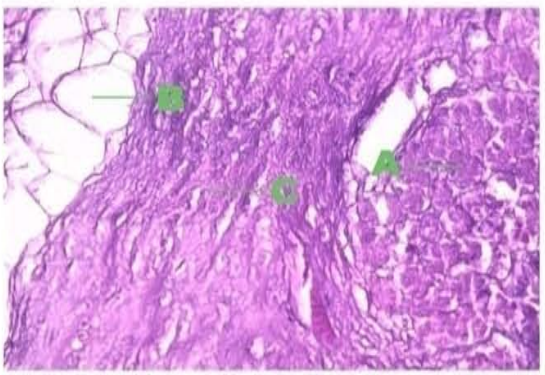

Fig- Treated Stomach 40x Resolution .0002 PPM 96 Hrs A- Cells Swealling B- Damage Sub Mucosa C- Shrinkage Tissue

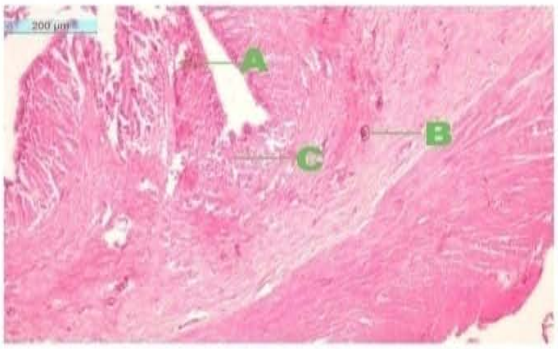

Fig-Treated Stomach 10x Resolution .0004 PPM 24 Hrs A- Breakage Microvilli B- Haemorhhage C- Necrosis

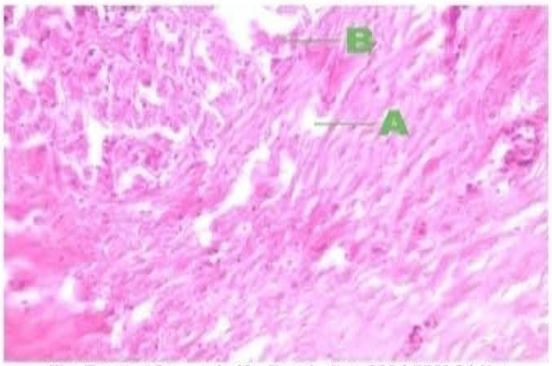

Fig- Treated Stomach 40x Resolution .0004 PPM 24 Hrs A- Vacuolation B- Cells Swealling

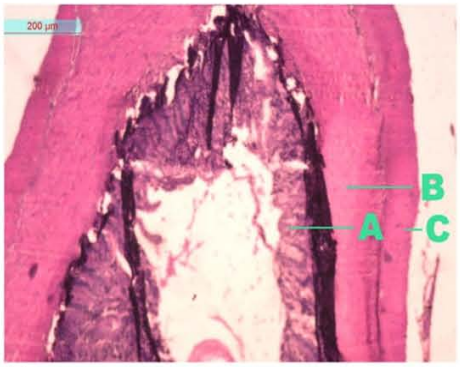

Fig-Control Stomach 10x Resolution
A- Microvilli B- Sub Mucosa C- Mucosa

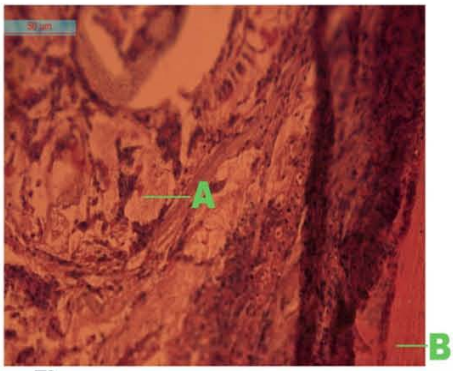

Fig-Control Stomach 10x Resolution
A- Normal Microvilli No Vacuolation
B- Normal Sub Mucosa

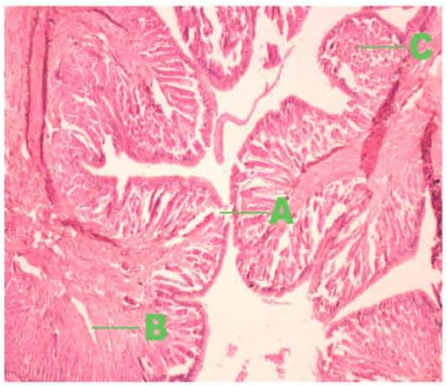

Fig-Treated Stomach .0002 PPM 10x Resolution 48 Hrs
A- Breakage Microvilli B- Vacuolation C- Necrosis

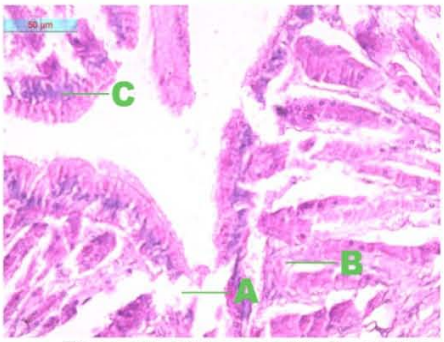

Fig-Treated Stomach 40x Resolution
.0002 PPM 48 Hrs A- Microvilli
Break B- Appoptic Cell
C- Aggregation of Blood Cells

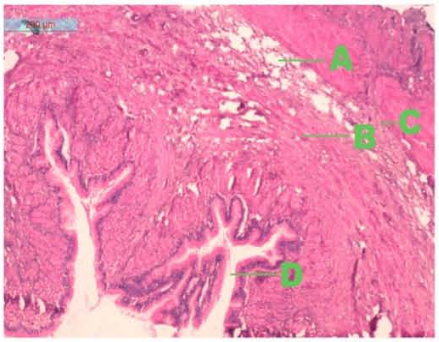

Fig-Treated Stomach 10x Resolution
.0004 PPM 48 Hrs A- Vacuolation on
Sub Mucosa B- Haemorhhage
C- Aggregation of appotic cells
D- Detouched Microvilli

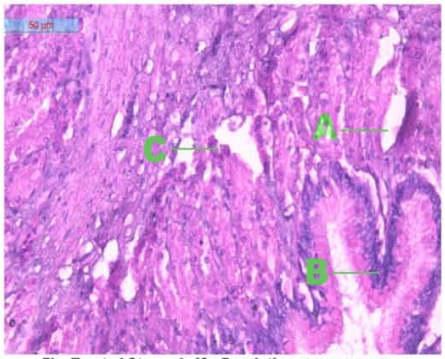

Fig- Treated Stomach 40x Resolution .0004 PPM 48 Hrs
A- Vacuolation B- Aggregation of Blood Cells C- Appoptic Cells

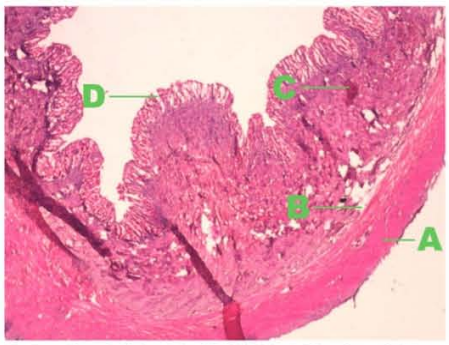

Fig- Treated Stomach 10x Resolution .0004 PPM 72 Hrs A- Thinner Serosa, Sub Mucosa
B- Damage Sub Mucosa C- Haemorhhage D- Breakage Microvilli

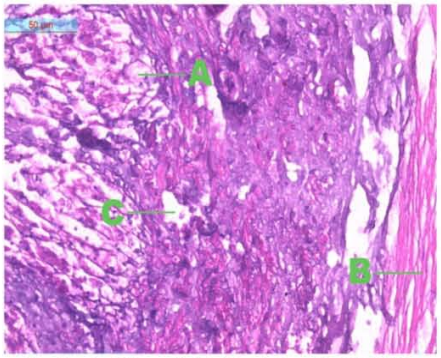

Fig- Treated Stomach 40x Resolution .0004 PPM 72 Hrs
A- Cells Swealling B- Sub Mucosa Damage C- Vacuolation

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Generation and Characterization of Atmospheric Pressure Air Plasma and Finding its Applications

By M.A. Rahman, M.K. Saha, M.K. Alam & M.R. Talukder
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Abstract - A high voltage RF plasma source is designed to produce atmospheric pressure air plasma. The plasma is produced at different electrode configurations. Properties of such plasma depend on several parameters such as frequency of the plasma generating source, input power and gas flow rate. The produced plasma is characterized by different diagnostic techniques in order to determine gas temperature, electron temperature, and electron density. It is desired to find out applications of such atmospheric pressure air plasma in food processing, surface modification, and material processing. One of the most fascinating applications of atmospheric pressure plasmas is its use for biomedical applications because of its capability of producing various biocidal agents including reactive species, UV radiation, and charged particles [1].

Keywords : *plasma, atmosphere, biomedical, species.*

GJSFR-C Classification : *FOR Code: 260699, 240304*

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Generation and Characterization of Atmospheric Pressure Air Plasma and Finding its Applications

M.A. Rahman [α], M.K. Saha [σ], M.K. Alam [ρ] & M.R. Talukder [ω]

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Keywords : *plasma, atmosphere, biomedical, species.*

I. Introduction

Plasma is a more or less ionized gas. It is the fourth state of matter and constitutes more than 99% of the universe. As temperature increases, molecules become more energetic and transform in the sequence: solid, liquid, gas, and plasma. In the latter stages, molecules in the gas dissociate to form a gas of atoms and then a gas of freely moving charged particles, electrons, and positive ions. This state is called the plasma state. It is characterized by a mixture of electrons, ions, and neutral particles moving in random directions that, on average, is electrically neutral ($n_e = n_i$) [2].

Plasma is created by applying energy to a gas in order to reorganize the electronic structure of the species (atoms, molecules) and to produce excited species and ions. This energy can be thermal, or carried by either an electric current or electromagnetic radiations. Due to a large diversity of possible applications [3–7], development of the devices aimed to generate atmospheric pressure plasmas have attracted a significant research effort in recent years. In order to ignite an electrical discharge at atmospheric pressure and maintain the plasma in a regime appropriate to a specific application, various electrical supply schemes, including superposition of a time varying periodic voltage to a dc voltage, have been developed. For the atmospheric pressure plasma source presented in this paper, the high voltage pulses produced by a self-oscillating fly back converter (FBC) are superimposed to a relatively low dc voltage. A FBC is very simple and has a good efficiency because it can be connected to the load without a ballast resistor. These devices require a high voltage pulse to initiate an arc discharge between the electrodes. Once the arc discharge has been ignited, another electrical circuit supplies the proper voltage and current for the discharge to run. Depending on the way they are activated and their working power, they can generate low or very high ''temperatures'' and are referred correspondingly as cold or thermal plasmas. This wide temperature range enables various applications for plasma technologies: surface coatings, waste destruction, gas treatments, food processing, chemical synthesis and also for biomedical application.

II. Design of Plasma Source

Figure 1 shows a schematic of the experimental set-up for optical emission spectroscopy (OES) measurements. The electrical circuit of the electrodes consists of two voltage sources in parallel connection. One of them is a low-power self-oscillating FBC able to produce negative high voltage pulses necessary to initiate an electrical discharge between electrodes. The second one is a conventional dc source which is used to sustain the electrical discharge. The FBC consists of the transformer, bipolar junction transistor and bias resistors. Discharge chamber is constructed from 0.35 inch (9 mm) ID stainless steel tube. The body of the chamber is grounded. There are gas inlet, view port and pressure gauge (HISCO, 131P30A) on one end plate and vacuum pump inlet, probe placing inlet and electrode placing on the other end plate. A transparent 4 mm width glass has been used for end view photos. Two copper electrode of cross section 2.6268 mm2 and the spacing ranging 0.5 to 3.00 mm are inserted through the electrode placing inlet in the chamber. We use spectrophotometer (Ocean Optics USB2000+XR1) and interface it with a computer to record the data.

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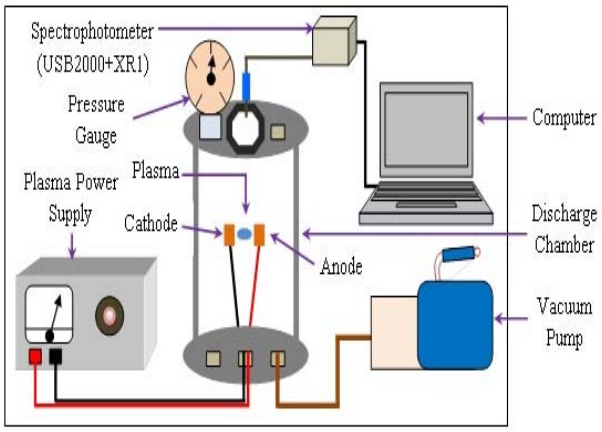

Figure 1 : schematic of the experimental set-up for optical emission spectroscopy (OES) measurements

III. Plasma Source Operation

In this paper we use 220 V AC of frequency 50 Hz. This AC voltage is converted to 24 V DC. We have been used 8200 μF 50V capacitor for dc filter. This supply is capable of supplying 3.0 A current. We have designed flyback converter circuit according to our requirements and secondary voltage and current are 5 KV and 50 mA, respectively at frequency 20 KHz. Discharge chamber has been used to reduce dust, water molecules etc from the air used to produce plasma. The geometrical structure and visible light emission distribution of the plasma are found to strongly depend on the applied power. Especially, the volume of the generated plasma is directly dependent on the magnitude of the applied voltage and frequency. Plasma is generated as long as the applied electric field across the discharge gap is high enough to initiate a breakdown. As expressed in Paschen's law (Eq. (1)),

$$V_b = \frac{B\,(p.d)}{\ln[A\,(p.d)] - \ln[\ln(1+1/\gamma_{se})]} \qquad (1)$$

the breakdown voltage [Vb] required to ignite the discharge is dependent on the process pressure [p] and the gap distance [d] between the electrodes, given that the discharge is confined between two electrodes, and [γ_{se}] is the secondary ionization coefficient for air. Constants A and B depend on the composition of the gas, their values for air are A=15 cm^{-1} $Torr^{-1}$ and B= 365 V cm^{-1} $Torr^{-1}$ [8]. Figure 2 shows the breakdown voltage of parallel plates in gas as a function of pressure and gap.

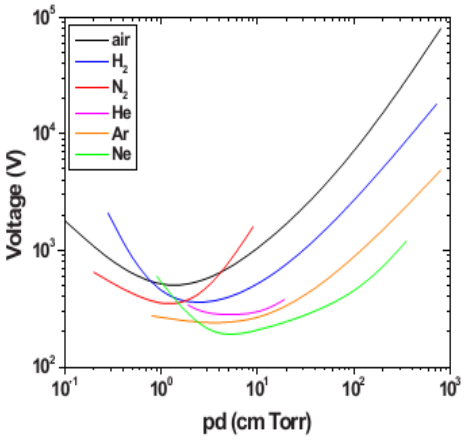

Figure 2 : Breakdown voltage of parallel plates in a gas as a function of pressure and gap distance for various gases [9]

As depicted in Figure 2, under atmospheric pressure conditions the electric field required to initiate the discharge is quite high because air is used as reactant gas. For example, atmospheric and higher pressure breakdown in dry air requires more than 30 KV with a 1 cm gap between electrodes. Even when the gap distance is shortened to d ≈ 1 mm it still requires about 3 KV at 1 atmospheric pressure. That is why the discharge gaps for most atmospheric pressure discharges are from mm to few cm. On the other hand, from the applications point of view, the short discharge gaps significantly limit the size of the objects to be treated if direct treatment (when to the gaps and the active radicals of the plasma reach the object byflowing with the gas) is applied, active radicals with short lifetimes and charged particles may already disappear before reaching the sample to be treated. the object is placed between the gaps) is desired [10]. If indirect treatment (the object is placed next To overcome the shortcomings of the traditional atmospheric pressure non-equilibrium plasmas, plasmas generated in open space rather than in a con fined discharge gap are needed.

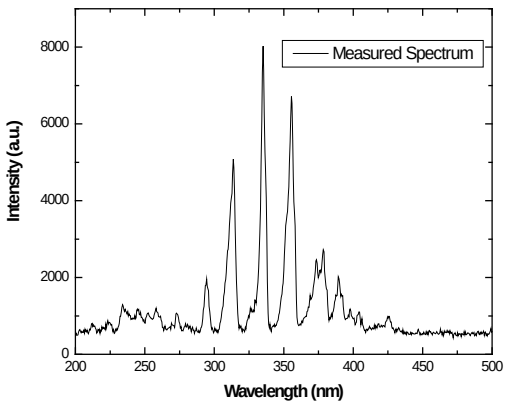

Figure 3 : Significant part of the observed spectrum of air plasma at atmospheric pressure (760 Torr)

Figure 3 shows significant part of the observed spectrum of air plasma at atmospheric pressure (760 Torr). The spectral range of the spectrograph is from 200 to 500 nm. We have employed Stark broadening to calculate electron density and the electron density is 6.4×10^{22} m^{-3}. In addition, we have also calculated (using air spectra) Electron temperature 9500K, Rotational temperature 4500K, Translational temperature 4000K and Vibrational temperature 5000K.

IV. Areas of Application

Our investigations are aimed at air plasma discharges at atmospheric pressure. Plasmas generated in atmospheric pressure have attracted increasing attention in recent years since they do not require vacuum chambers or pumping systems, and are capable of continuous plasma processing. Atmospheric pressure plasma devices developed and made available commercially thus far can generate plasmas from room temperature helium, argon, or air. The atmospheric pressure discharge plasmas afford new parameter regions, for example, (i) high density, (ii) minute scale, and (iii) non-equilibrium, which are different from the conventional plasma regions [11]. Atmospheric pressure air plasma sources are widely used for numerous diversified applications such as air pollution control, bio-decontamination, material processing, plasma-assisted combustion, aerodynamic flow control, and electromagnetic wave shielding [12]. In many cases atmospheric pressure air plasma sources have certain limitations and cannot compete with low pressure plasma. At the same time they have a very promising unique potential for a number of new non-conventional applications, including new surface treatments and processing of materials. The atmospheric pressure air plasma sources also have low maintenance requirements resulting in relatively low energy costs.

V. Conclusion

In this paper a plasma source, operating at atmospheric pressure, supplied practically at a relative low dc voltage by means of a simple and inexpensive electrical circuit, is presented. Circuit topology enables a high efficiency of the electrical energy to plasma energy conversion. The plasma parameters that we have calculated (electron density, electron temperature, rotational temperature, vibrational temperature, transitional temperature) indicates that this designed plasma source can be used for various eco-friendly industrial applications as it can produce substantial amount of reactive species and avoid thermal damage. Such a source can be used to break down hazardous & toxic compounds to elemental constituents by high temperatures. Air plasma, which breaks down the surrounding air rather than an external fed noble gas, is also attracting attention because it has great potential in various biomedical applications and it is highly portable as it only requires a handy discharge device and a power source [13].

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Analysis of Biochemical Parameters of *Amaranthus Tristis* During Seed Germination using $Cacl_2$, Bijamrita and Cyanospray

By Chitra Devi Karuppaswamy & Malliga Perumal
Bharathidasan University

Abstract - The influence of inorganic and organic fertigations during seed germination on *A. tristis* was evaluated in the present study. Effect of different concentrations of chemical ($CaCl_2$) and different organic fertilizers such as Bijamrita and cyanospray on seed germination at room temperature were analyzed for protein, amino acid and amylase enzyme in both untreated and treated ways respectively. Our findings indicated that during germination the amount of amylase and amino acid increased at 48th hrs in combination with 25% Bijamrita and 0.3% cyanospray (50:50) when compared with other treatments, but, the protein content was significantly reduced during germination when compared with non-germinated seeds. Possible optimum concentration was determined to induce seed germination and thereafter growth of seedlings.

Keywords : protein, amino acids, amylase, cyanospray, bijamrita, seed germination, A. tristis.
GJSFR-C Classification : FOR Code: 250199

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Chitra Devi Karuppaswamy [α] & Malliga Perumal [σ]

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Keywords : protein, amino acids, amylase, cyanospray, bijamrita, seed germination, A. tristis.

I. Introduction

A. tristis is recognized as an easy growing, productive, tasty and nutritious leaves (Baquar and Olusi, 1988). The green-colored leaves are grown throughout the world as ornamentals and in Asian countries it is occasionally eaten raw in salads and the soft stems are eaten like asparagus in India. Medicinally *A. tristis* is used externally to treat inflammations, and internally as a diuretic. In Africa *A. tristis* is grown on a limited scale in home gardens or as a commercial vegetable, but it is of little economic significance.

Seed germination and seedling development are well regulated process in plant physiology involving high metabolic activity and generation of reactive oxygen species (ROS). Emergence of the seedling takes place 3–5 days after sowing with fast vegetative development. Like maize and sugar cane, Amaranthus is characterized by the C4-cycle photosynthetic pathway, which means a high photosynthesis at high temperature and radiation and flowering may start 4–8 weeks after sowing. During seed germination, a breakdown of seed reserves, carbohydrates, and protein (Vanderstoep,1981) takes place. Though germination do not increase the protein value of the grain or its biological utilization (Colmenares De Ruiz, 1990), the loss of proteins from the cotyledons could be due to the transport of amino acids to the growing axis or to respiratory loss, or it might result in the accumulation of free amino acids in the cotyledons (Beevers and Spittoesser, 1968) and free amino acid contents are increased during germination period (Ali Al-Heal, 1992).

Bijamrita (Bija-seed; Amrita-elixir) is a traditional biofertilizer especially used for seed treatment. It enhances germination, protects from phytopathogenic infections and increases till ring and plant vigour (Subhash Palekar, 2006). Cyanospray is produced by biodegradation of coir pith using fresh water cyanobacterium (*Oscillatoria annae*) (Malliga *et al.,* 2012).

Amylases are known to play a major role in starch breakdown in cereal seeds (Guglielminetti *et al.,* 1995) and during germination under low oxygen stress, rice seeds are capable of partial degradation of starch into readily fermentable carbohydrates to generate the minimum energy required for growth of the coleoptiles. Starch is a major energy source for developing rice embryos and the seedling can be used to supply energy for growth, and also build up cellulose to make up cell walls for the new cells that are formed as the seed grows.

The key objective of this study is to determine the efficacy of seed germination status of *A. tristis* using calcium chloride, Bijamrita, cyanospray and combination of Bijamrita and cyanospray. The effect of protein, amino acid and amylase during seed germination of *A. tristis* were also analyzed. The main objective, therefore, is an attempt to understand the role of protein, amino acid and amylase during various stages of seed germination in the respective plant. This study certainly helps in understanding the effect of inorganic and organic fertigations on seed germination in *A. tristis* at 12, 24, 36 and 48 hrs.

II. Materials and Methods

a) Calcium Chloride Solution

Different concentrations such as 0.1% to 0.5% of $CaCl_2$ were prepared using distilled water and only distilled water was used for germination study as control.

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b) Bijamrita Solution (Palekar, 2007)

5 Kg of wild cow dung was taken in a cloth and bound by tape and was submerged in 20 L of water for 12 hrs. Simultaneously, 50g of slaked lime was dissolved in 1L of water in separate container and kept stable for overnight. After 12 hrs, this bundle of cow dung was squeezed thrice, thereby: all the essence of cow dung will be drawn to water phase (cow dung extract). 1Kg of soil was dissolved in cow dung extract by stirring it well. To this, 5L of wild cow urine and lime water was added and mixed well. The Bijamrita was applied in different concentrations (12.5%, 25%, 50% and 100%) and used for germination study.

c) Organism and culture condition

A fresh water cyanobacterium belonging to *O. annae* was obtained from the germ plasm of NFMC, Bharathidasan University, Tiruchirapalli, Tamilnadu, India. The culture was maintained in BG 11 medium (Rippka, 1979) at 1500 lux light and 25±2°c with 14/10 Light/Dark cycle.

d) Lignocellulosic Waste

Coir pith was collected from coir industries nearby Srirangam, Tiruchirapalli, Tamilnadu, India.

e) Cyanospay

O. annae with coir pith was inoculated in the ratio 1:10 (dry weight). After 25-30 days of incubation, pellets and supernatant of partially degraded coir pith were separated and the dried pellet was prepared in different concentrations by dissolving pellet in distilled water to be used as cyanospray and without germinated seeds were used for analyzing all the parameter noted as untreated seeds (Abraham Christopher *et al.,* 2007).

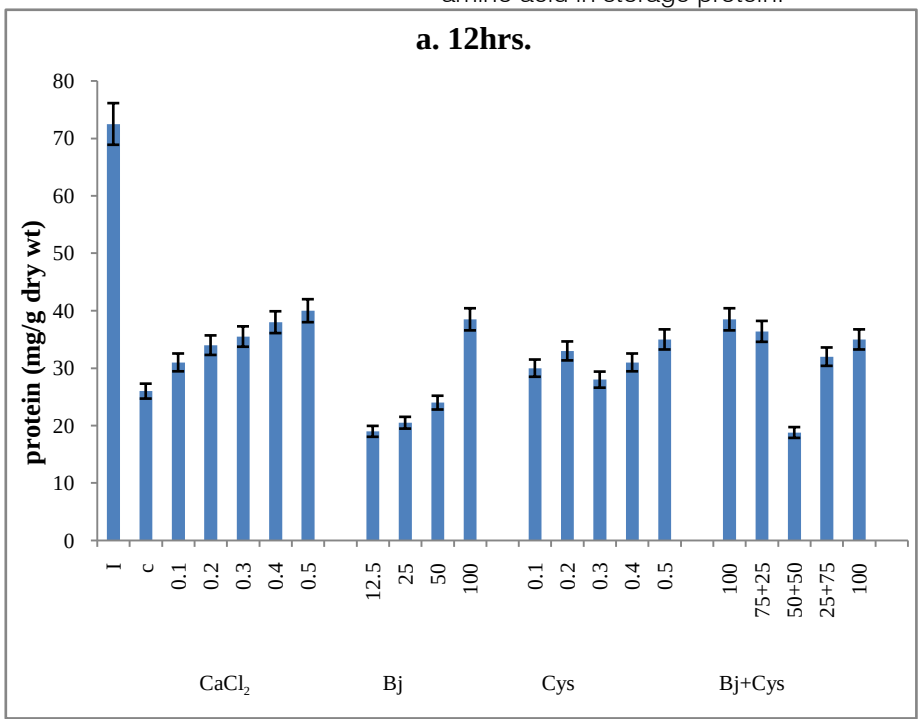
f) Chemical analysis

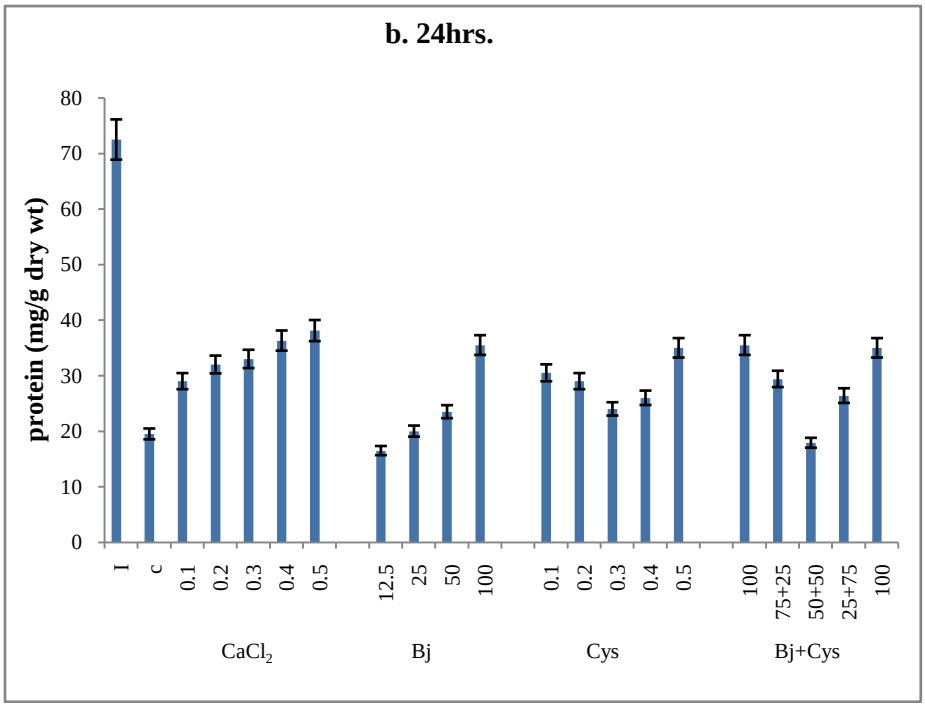
Different biochemical parameters like protein (Lowry *et al.,* 1951), amino acid (Moore and Stein, 1948), and amylase (Katsuni and Fukuhara, 1969) were analyzed at 12, 24, 36 and 46 hrs of germination.

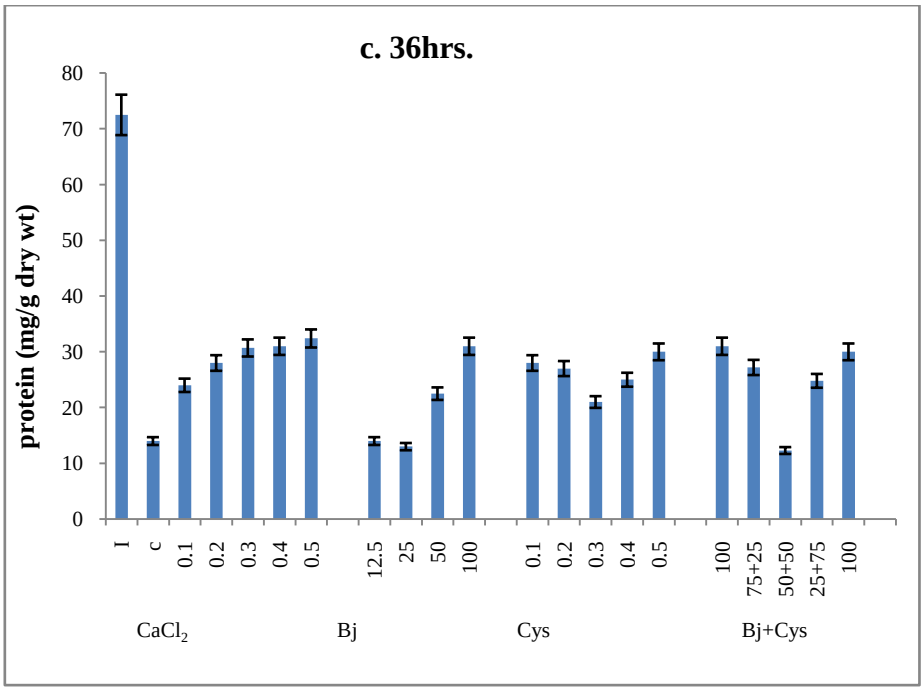
III. Results and Discussions

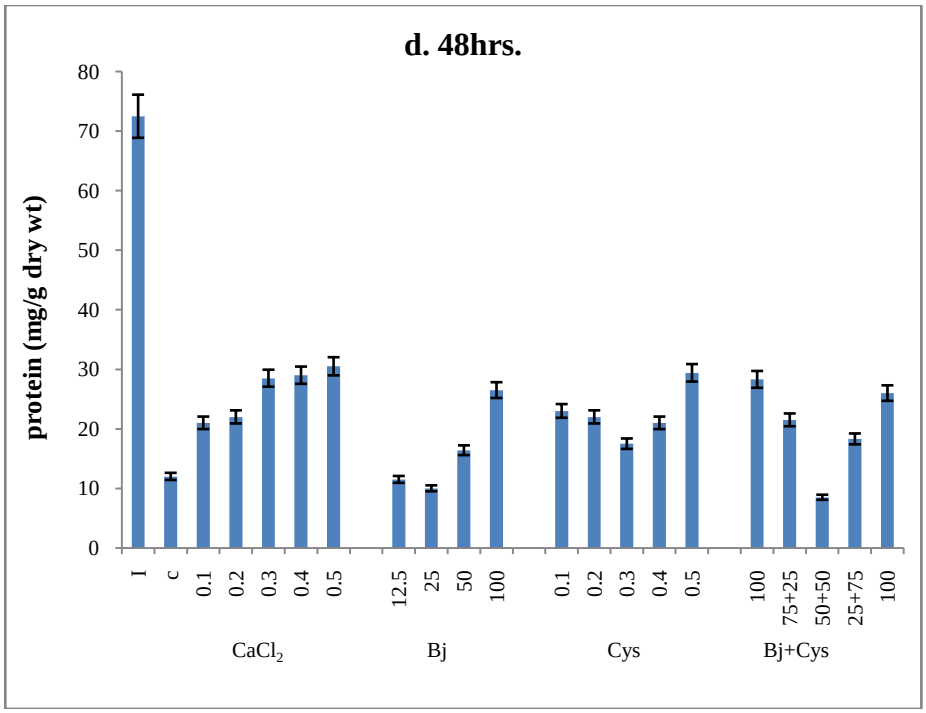
a) Protein

The total protein content was high in untreated seed of *A. tristis* (Fig 1) observed during, germination period but on the contrary, the protein content was decreased at moderate level of 25% Bijamrita and 0.3% cyanospray from 12 - 48 hrs of incubation period. (Fig 1 a-d). Henkel, (1965) reported that calcium chloride lead to redistribution of nutrient reserves resulting in greater internodal length in crop. Sashidhar *et al.,* (1977) reported an increased yield in groundnut when seeds were treated with one per cent calcium chloride for eight hours with high free proline accumulation which is an adaptive mechanism of drought tolerance. However, the maximum reduction of protein content was observed in 48th hr in combination with 25% Bijamrita and 0.3% cyanospray (50:50) preparation when compared with all other treatments (Fig 1.a-d) and the protein content in seeds treated with $CaCl_2$ (0.5%) was found to be higher when compared to all other treatments including control. As the seeds of higher plants accumulate large amounts of storage proteins during seed development and seed maturation, which are mobilized to provide building blocks and energy for seed germination and early seedling growth upon seed germination (Bewley and Black, 1994). During seed development and maturation, storage proteins are broken down into newly synthesized amino acids which are major source of amino acid in storage protein.









-Initial, C-Control, $CaCl_2$-Calcium Chloride, Bj- Bijamrita, Cys- Cyanospray. (Different concentrations in percentage).

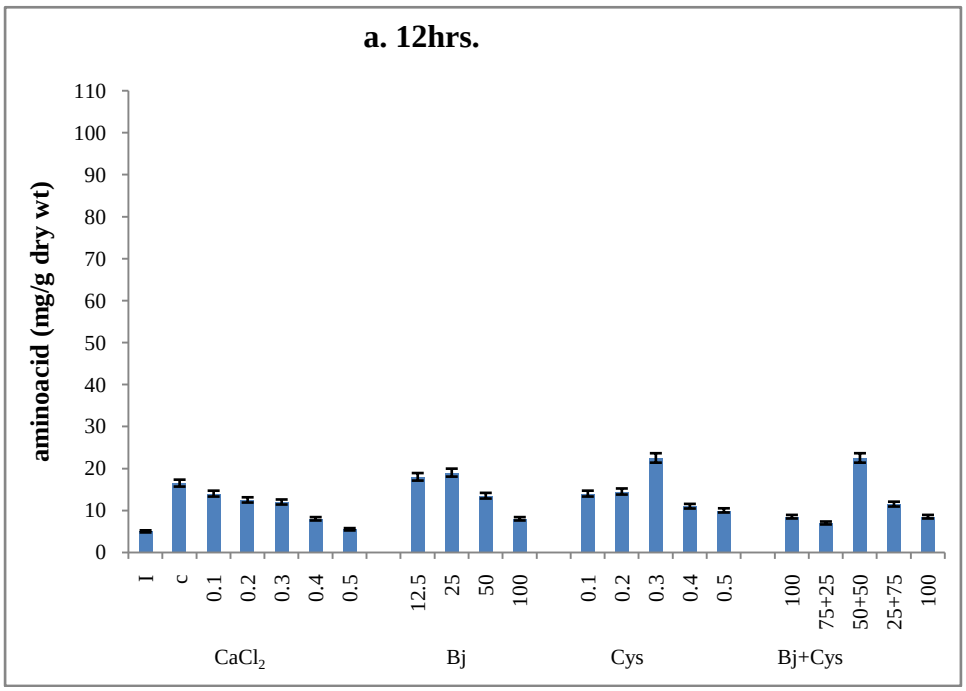
Figure1 : Effect of different concentrations of $CaCl_2$,Bijamrita and Cyanospray on protein content of *Amaranthus tristis* L.

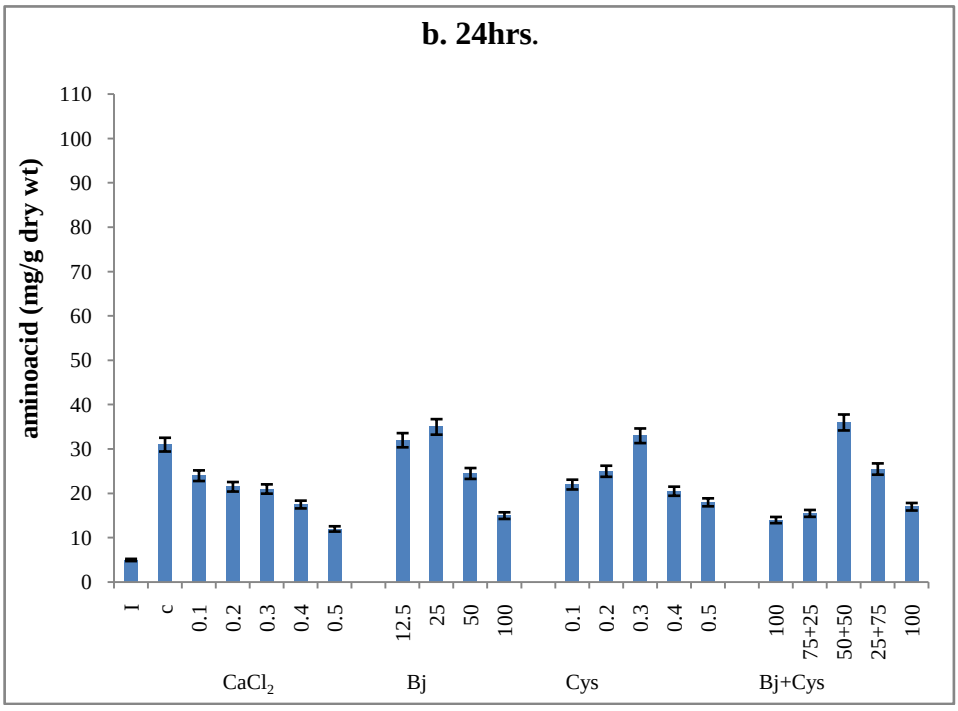
The protein level decreased during germination in *Lupinus leteus L* (Mariusz *et al*., 1992), Australian sweet lupin (Rumiyati *et al*., 2012), *Ceiba pentandra* seeds (Chekuboyina *et al*., 2012), Horse gram seed (Pek Geok Pang *et al*., 2012) and chickpea seeds (Guilherme *et al*., 2005).

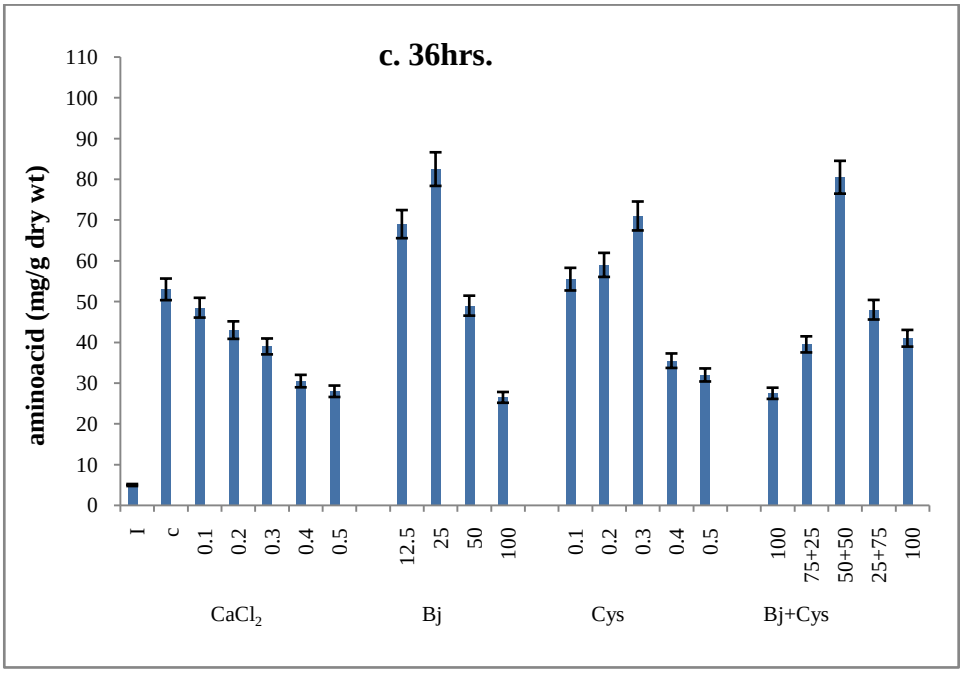
Same results were reported by (Muhammet *et al*., 2012) in the case of safflower (*Carthamus tinctorius* L.) and (Yoshida *et al*., 1997) in *Vigna mungo* cotyledons during germination. Considerable decrease in the protein content was observed in germinating *Lupinus luteus* and *L. angustifolius* (Olczak *et al*., 1992), soybeans (Tan-Wilson *et al*., 1996), Bambara groundnuts (*Voandzeia subterranea* L. Thouans) (Obizaba and Egbuna, 1992), fluted pumpkin (*Telfairia occidentalis* Hook) (Giami *et al*., 1999), and sunflower seeds (*Helianthus annuus*) (Balasaraswathi and Sadasivam, 1997). The loss of proteins from the cotyledons could be due to the transport of amino acids to the growing axis or to respiratory loss, or it might result in the accumulation of free amino acids in the cotyledons. These reports are similar to the results of (Beevers and Spittoesser, 1968) in germinating Peas and in the cotyledons of Mung Bean Seedlings (Kern and Chrispeels, 1978).

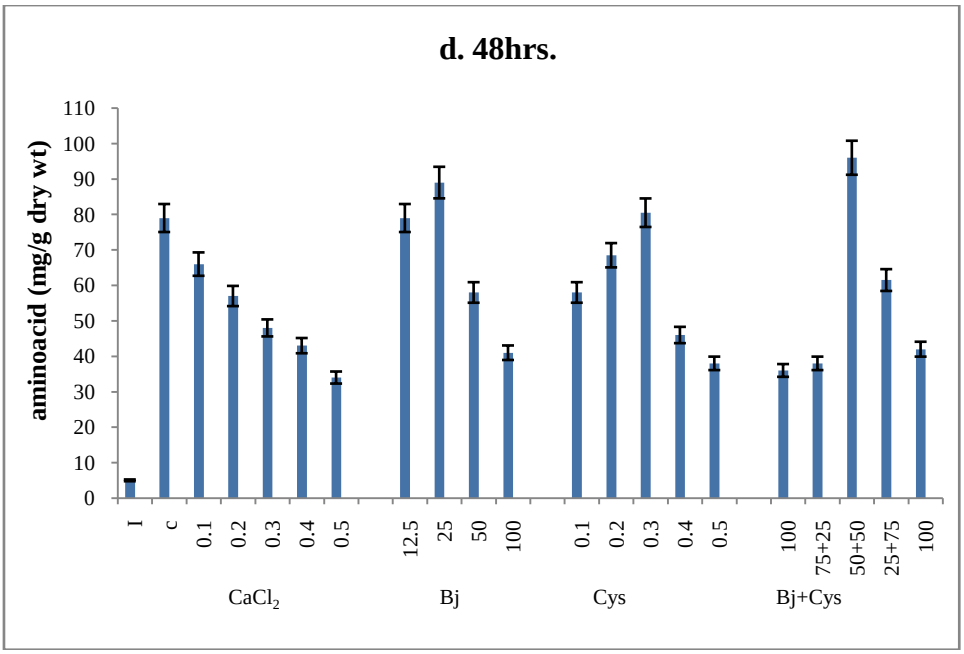
b) Free amino acid

The amino acid content was very low in untreated seeds, but the control and treated seeds during germination period showed the presence of more amino acid content than normal seeds (Fig.2 a-d). From the data *(Fig.2 a-d),* it could be observed that all the treatments during 36-48hrs germination showed increase in amino acid content especially in combined effect of Bijamrita with cyanospray (50:50) *(Fig.2 a-d)* at 48th hr. When compared to all other treatments, increased amino acid content in certain concentrations of organic fertigations at 48th hr can be due to induction of germination, which results in hydrolysis of protein for their growth thereby releasing amino acids for their growth.









-Initial, C-Control, $CaCl_2$- Calcium Chloride, Bj- Bijamrita, Cys- Cyanospray
(Different concentrations in percentage)

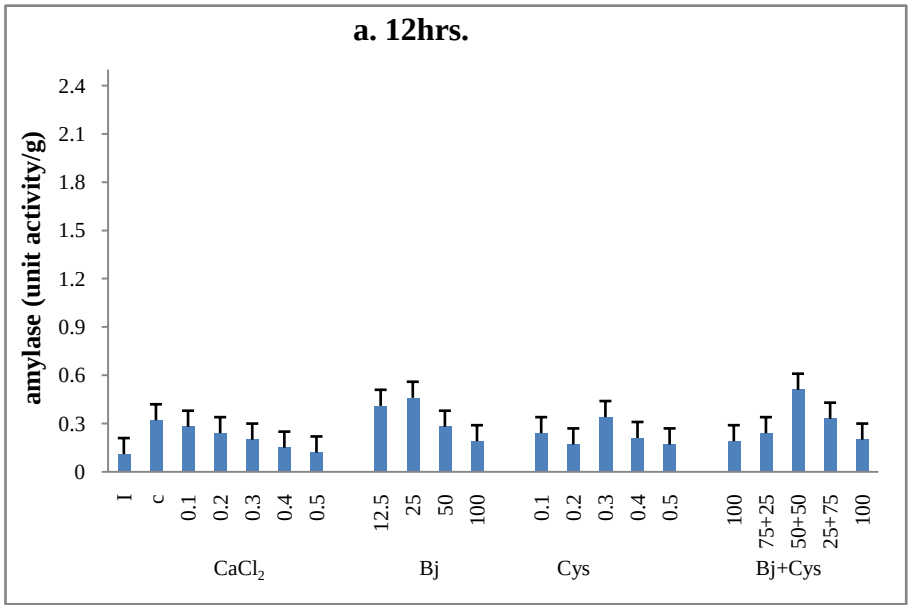
Figure 2 : Effect of different concentrations of $CaCl_2$,Bijamrita and Cyanospray on amino acid content of *Amaranthus tristis* L.(12, 24, 36 & 48 hrs)

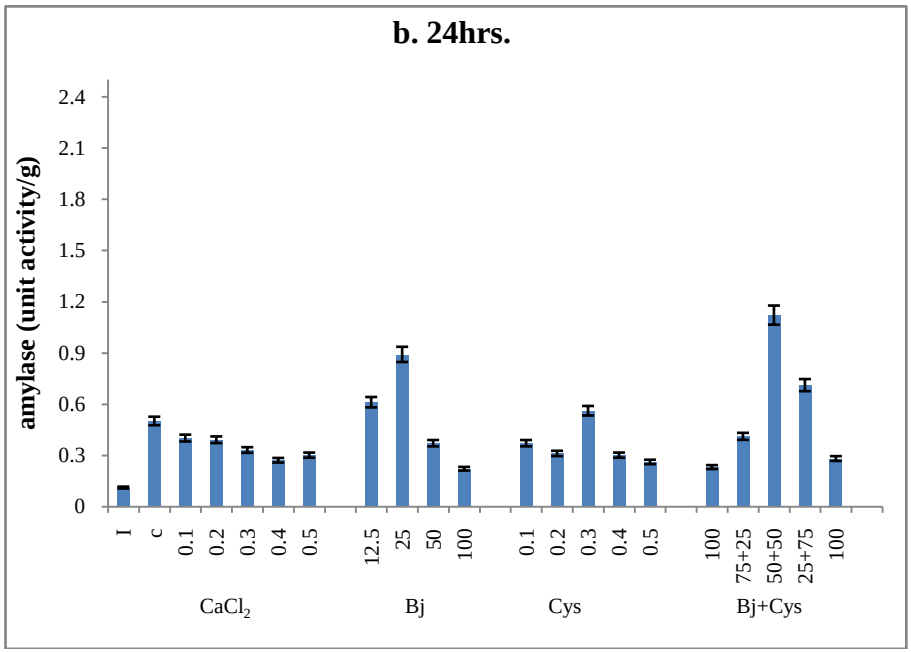
These observations were in agreement with those of (Boulter and Barber, 1963) on amino acid metabolism during germination of Viciu fuba L. (Zivile and Honorata, 2009) reported that amino acid increases during germination of Broccoli Seeds. The increase in amino acid content up to 9th day could be due to rapid hydrolysis of proteins, which resulted in release of free amino acids. The reduction in total amino acids showed rapid utilization and rapid translocation to the growing axis. Similar results were reported by (Ali Al-Heal, 1992) in Cassia senna seedlings. (Chekuboyina et al., 2012) observed that there was an increase in amino acids during germination in Ceiba pentandra seeds.

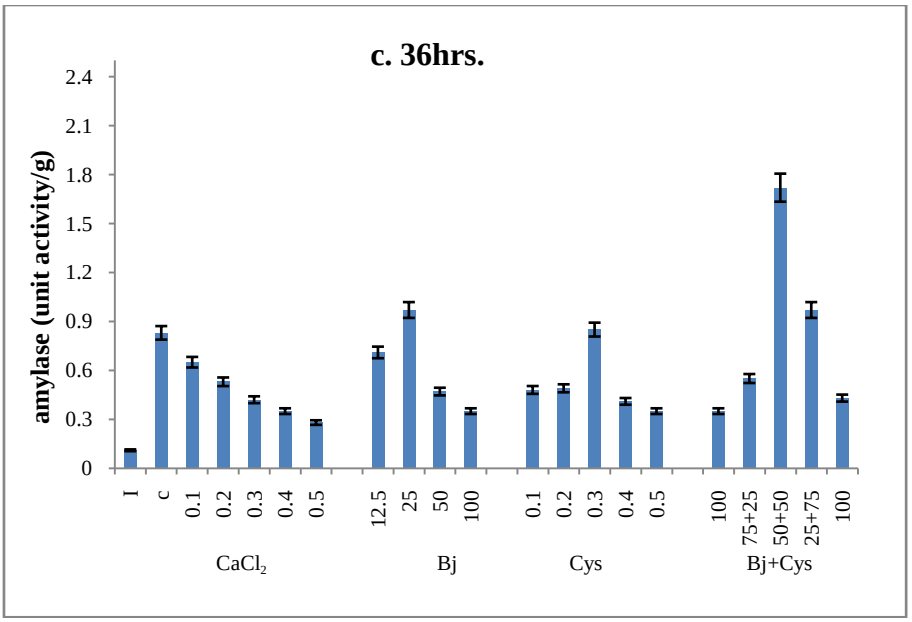
c) Assay of Amylase

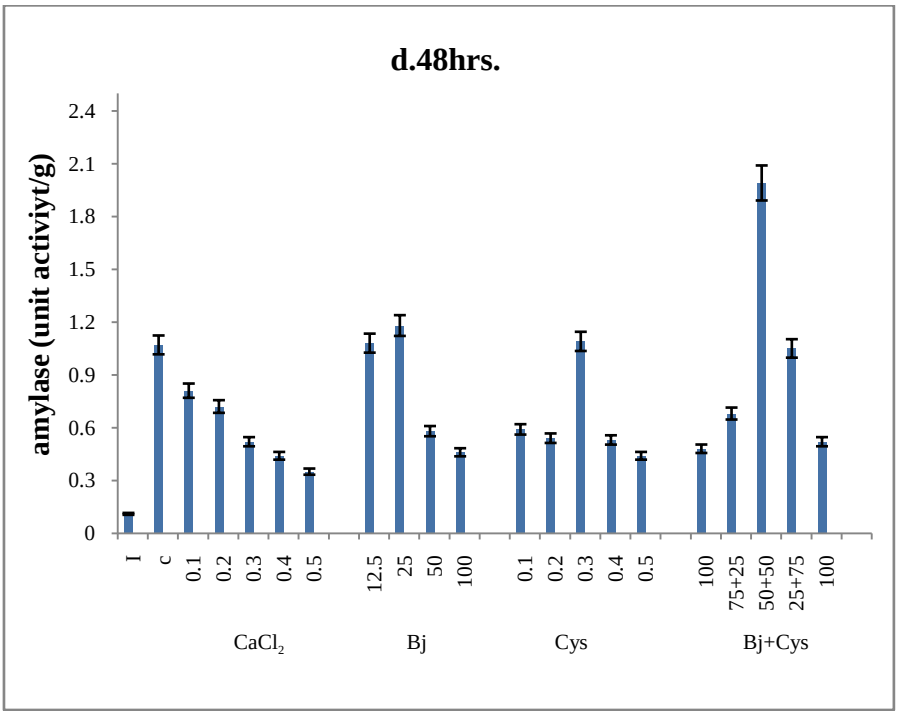
A.tristis seeds soaked with water, CaCl2, Bijamrita (25%) and cyanospray (0.3%) separately, the

activity of amylase were higher (Fig 3) at 36 and 48 hrs. But after 48 hrs the equal combination of Bijamrita (25%) and cyanospray (0.3%) showed better result than other treatments of seed germination (Fig 3.d).









-Initial, C-Control, CaCl2- Calcium Chloride, Bj- Bijamrita, Cys- Cyanospray.
(Different concentrations in percentage).

Figure 3 : Effect of different concentrations of $CaCl_2$,Bijamrita and Cyanospray on amylase content of *Amaranthus. tristis*

(Uriyo, 2001) had also reported same results in cowpea and found that germination had a high significant effect ($P<0.05$) on cowpea α-amylase activity. α -amylase activity attained a maximum level of germination for 3 days and had begun to decline on 4th day (Malleshi *et al.,* 1989). (Sumathi *et al.,* 1995) also showed improvement in α-amylase levels of horse gram, moth bean and field bean during germination. These findings agree with other reports regarding α-amylase production during germination of plant seeds other than day (Malleshi *et al.,* 1989). (Sumathi *et al.,* 1995) also (Bodin, 1995), millet (Gimbi and Kitabatake, 2002) and sorghum (Lasekan, 1996).

IV. Conclusion

The seeds of *A. tristis* were rich in proteins and their levels decreased during the germination process indicating their key role in the growth of embryonic axis.

Germination caused an increase in amino acid and amylase content in combination of 25% Bijamrita and 0.3% cyanospray (50:50) at 48hrs. This could be the optimum concentration to induce seed germination and thereafter growth of the seedlings. It also suggested that the period of the most intense mobilization of seed reserves that were stored in cotyledons occurred at germination and that the reserves were strongly reduced at the seedling growth stage.

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Plants Community Composition and Dynamism During Summer in Tehsil Takht-E-Nasrati Hills, District Karak, Pakistan

By Musharfa Khan & Farrukh Hussain
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Abstract - Plant life community structure is a key marker of long-term vegetation change in semi-arid ecosystems. In the present investigation overall 11 plant communities were recorded during summer. The number of plant species differs in different communities. As a whole in plains the Cenchrus-Zizyphus-Saccharum community was developed and composed of 36 species. There were 9 tree, 12 shrub and 15 herb species. The importance value contributed by three dominants species i.e., Zizyphus maurtiana, Aerua persica and Rhazya stricta was 63.34 while total importance value of 236.66 was provided by the remaining species. The contribution by tree was 47.76, shrubs (IV = 82.05) and herbs (IV = 170.20). The soil of the area had better calcium carbonate in the range of (12.3 – 12.7 %), with soil pH (6.06 – 8.13). The concentrations of P and K content were found in the range of (3.64-3.86 mg Kg-1) and (112-127 mg Kg-1). The EC was found in the range of (0.15-0.21 dS m-1). The soil texture was found from sandy clay to sandy clay loam. These results emphasize the continuous need for long-term ground-based ecological monitoring in conjunction with satellite-based monitoring of changes in plant life cover.

Keywords : *altitudinal effect, community, plant life structure, life form and leaf size classes.*

GJSFR-C Classification : *FOR Code: 780105, 270402*

Strictly as per the compliance and regulations of :

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I. Introduction

The Tehsil Takht-e-Nasrati hills comprise one of the richest and most curious ecosystems on earth. The Tehsil Takht-e-Nasrati hills are characterized by low productivity, high intensity of solar radiation and high degree of resource seasonality. The vegetation of this fragile biome is adapted to the insignificant conditions occurring with thin populations. Tehsil Takht-e-Nasrati high altitude grazing area are very important being a wild life habitat, water catchment and a livelihood source for nomadic and transhumant inhabitants. The community structure and distribution patterns of Tehsil Takht-e-Nasrati and their hills have not been given due attention till the date by the plant ecologists, and hence poorly understood (Khan, 2012). The distribution and community structure of plant life is governed by adverse edaphic and climatic factors; mainly by rainfall and redistribution of water that decrease with the increase in altitude. Temperature is also one of the most important limiting factors controlling the distribution and community structure of Tehsil Takht-e-Nasrati plant life. Here the altitude has much greater effect on temperature than latitude. Mean annual temperature decrease with increase in elevation, more rapidly in summer than in winter. This altitude based temperature gradient is the vital factor shaping the plant life types and determining their diversity and distribution (Heaney and Proctor, 1989; Tanner *et al.*, 1998; Vazquez and Givnish, 1998).Hilly areas are characterized by scanty rainfall, high ultraviolet (UV) radiation, high wind velocity, blizzards, low temperature and snowstorms. The plants of this zone show an adaptation to these conditions and are generally dwarfed, stunted, wooly or spiny, and develop a mosaic patch of different forms. They possess an early growth initiation with a tiny vegetative period ranging from several days to a few months. The community as a whole usually exhibits seasonal fluctuations, and its structure and composition are strongly influenced by the extent to which periodic phenomena in the individuals are adjusted to each other (Kershaw, 1973). In Tehsil Takht-e-Nasrati, the hilly area cover 50% (Khan et al., 2011). These areas are used for grazing throughout the year. The hilly area are severely degraded due to nomadic and sedentary livestock overgrazing. Due to huge population increases and frighteningly increasing urbanization practices, existing reserve forests and grazing lands are overburdened with community rights making it impossible to reduce the grazing pressure (Gupta & Nanda, 1970; Gupta, 1977). Grazing practices are one of the important determinants of vegetation distribution patterns and having most obvious impact on the floral biodiversity of an area (Vallentine, 2001). Many researchers (Vigne, 1842; Duthie, 1892; Stewart, 1961; Dickore, 1995; Negi, 1995; Sardar, 1997; Stainton, 1998; Shinwari and Gillani, 2002) have studied different aspects of vegetation structure and distribution patterns in different parts of Pakistan. Phytosociology or plant sociology is an invaluable method for vegetation survey and assessment involving investigation of characteristics of plant communities using simple and rapidly employing field techniques (Rieley and Page, 1990). In the present study, an effort has been made to investigate and analyse correlation of vegetative attributes with key environmental factors i.e. altitude.

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II. Research Area

The Tehsil Takhti Nasratti is situated at 32.47° to 33.28° North and 70.30 ° to 71.30° East. The Tehsil is bounded by Tehsil Banda Dawood Shah on the North West, Tehsil Karak on the North East, District Mianwali and District Lakki Marwat on the South East, and Tribal area Adjoining District Bannu on the South West (Fig. 1). The total area of Tehsil is about 613.66 Sq. kilometer. Majority of the area consists of rigged dry hills and rough fields areas i.e. 323.97 Sq. kilometers and agriculture land is about 289.7 Sq. kilometer. The major income source of the people is Agriculture, which is rain depended. The area is situated at 340 m above the sea level. Environmental data showed that mean air temperature was high in month of June (39.5° C) and low in month of September (21.95° C), relative humidity was high (77.21%) in month of September and low (30.73 %) in May, rainfall (121.6 mm) was high in July and low (31.6 mm) in May, soil temperature (26.77° C) was high in month of July, wind speed was high in month of June (5.5 Km/h) and low (3.7 Km/h) in September, which indicated dry condition during summer. Summer season started from May to September in the area and 11 plant communities were recognized in plains. The investigated area shows altitudinal variation i.e. from 340m - 500m. This also caused deviation in plant life structure (Table 1).

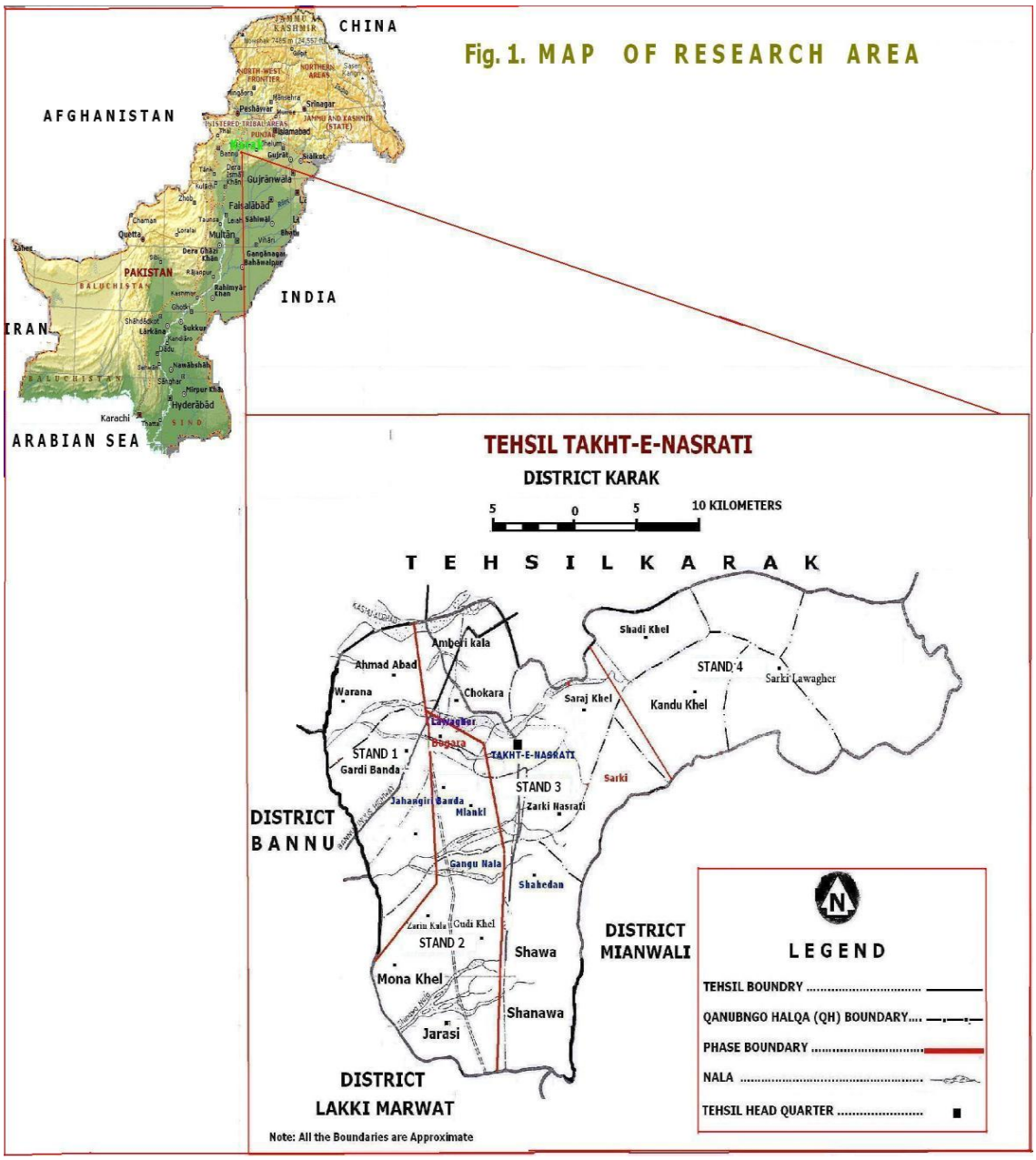

Figure 1 : Map of Tehsil Takht-e- Nasrati showing research spots

Some serious ecological operating problems facing to the area are as follows:

a) Deforestation

A serious ecologically operating problem is rapid cutting of plants (Fig. 2).

Figure 2 : Cutting of Acacia modesta for fuel and fodder purposes is common in the area

b) Over Grazing

Grazing, browsing, and trampling by domestic livestock is a serious problem in the area (Fig. 3). Grazing has caused to decline vegetation where palatable species have been reduced and non-palatable species increased.

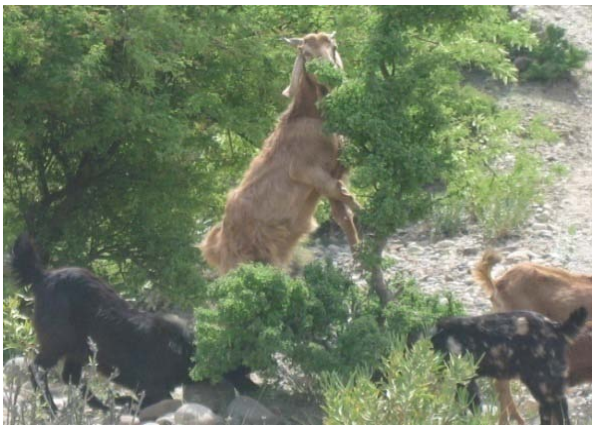

Figure 3 : Grazing of trees by goat

c) Shortage of Water

Water shortage is one of the most threatening factors for irrigation and drinking because the rainfall is scanty in the areaand it is transported from far off places by donkey, Camel etc or on heads (Figs. 4, 5).

Figure 4 : Drinking water is a serious problem in the area

Figure 5 : Open storage water tank for collection of rain water

d) Soil Salinity

Some areas like Warana is facing salinity hazard. The water is neither suitable for cultivation nor for drinking It has poor sparse vegetation.

e) Soil Erosion

Soil erosion by the seasonal torrential stream water / wind in the plain and by rainwater in sloping area is also a threat to habitat (Fig. 6).

Figure 6 : Soil erosion is common ecological problem in the area. See exposed hard bed rock

Table 1 : Meteorological data of Tehsil Takht -e -Nasrati for the year 2001 -2010

Months	Temperature (C°)		Humidity (%)		Rainfall (mm)	Soil temperature (C°) Average	Wind speed (Km Per Hour)
	Max	Min	Max	Min			
January	19.18	4.26	75.80	35.24	27.43	7.03	2.9
February	21.69	7.29	77.39	42.23	37.72	9.14	3.2
March	28.20	12.06	75.38	35.23	37.17	13.89	3.5
April	34.74	17.94	66.12	29.42	36.54	19.02	5.2
May	38.32	22.33	59.66	30.73	31.6	21.87	5.4
June	39.50	25.9	59.96	32.89	74.24	25.78	5.5
July	38.44	25.76	73.33	38.76	121.6	26.77	5.2
August	36.66	25.29	75.68	42.61	108.3	26.37	4.1
September	35.47	21.95	77.21	39.29	61.58	23.49	3.7
October	32.33	16.79	71.55	35.51	15.13	20.09	3.5
November	26.71	10.01	71.56	36.66	5.80	14.10	3.2
December	21.93	5.67	75.20	35.90	15.38	8.96	3.1
Mean	31.1	16.27	71.57	36.21	47.71	18.04	4.04

Source: Agricultural Research Farm Ahmad Wala Karak.

III. Materials and Methods

The phytosociological expeditions were carried out in the summer, 2010 -2011 to the Tehsil Takht-e-Nasrati. Quadrat method was used to study and analyse the plant life dynamics as well as to collect the primary data for statistical analyses. A total of 11 sites were laid in the study area. 10 Quadrats were laid in each selected sites having best representation of floral biodiversity and geographic extent of the area. Vegetation attributes including frequency, density and cover were recorded along with environmental coordinates like latitude, longitude, altitude and slope using GPS. The importance value of each species was compiled adding RD, RF and RC following Hussain (1989). On the basis of the highest importance values of the first three dominant species from each layer, the communities were established and named. Plants from the premises of sampling points as well as isolated vegetation patches were also collected to record maximum number of species and their distribution patterns. Collected samples were pressed, dried and transported to herbarium of University of Peshawar Khyber Pakhtun Khawa, Pakistan, where they were identified and classified following Stewart (1961) and Nasir and Ali (1972-1994).

IV. Edaphology

Two kg soil sample was collected from 11 sites of Tehsil Takht-e-Nasrati up to 15 cm depending upon the area situation using the outer periphery of plants canopy or at the centre of plants with the help of soil auger and mixed to make a composite sample. It was dried and passed through 2 mm sieve and stored in a polythene bag. There were 5 replicates from each site. These were analyzed for different chemical and physical parameters including soil texture, organic matter, lime contents, pH, EC, phosphorus and potassium as following standard methods (Bouyoucos, 1962; Hussain, 1989; Jackson, 1962).

V. Results

a) Stand – 1 (500 – 599 m)

In stand 1, total 7 sites were studied i.e. Chokara, Ambiri Kala, Takht-e- Nasrati, Siraj Khel, Shahidan Banda, Zarki Nasrati and Shawa in which 7 communities i.e. *Cymbopogon-Rhazya-Zizyphus* community (CRZ), *Cymbopogon-Saccharum-Zizyphus* community (SCZ), *Fagonia-Rhazya-Zizyphus* community (FRZ), *Cleome-Phoenix-Capparis* community (CPC), *Cenchrus-Cassia-Zizyphus* community (CCZ), *Capparus -Aerua-Acacia* community (CAA), *Boerhavia-Acacia-Capparus* community (BAC) were recorded respectively. Entirely 34 plant species consist of 6 trees, 12 shrubs, 13 herbs and 3 grasses were documented forming the *Zizyphus-Aerua-Rhazya* community (ZAR). The highest number of plant species (23) were present in CPC. The highest number of tree (4) were present in CRZ, SCZ and CPC while shrubs (8) in CAA and herbs (10) in CPC. The Importance value contributed by three dominants species was 63.98 while total importance value of 236.02 was provided by the remaining species. Furthermore, the highest TIV given by trees (65.83) was present in BAC, shrubs (103.72) in SCZ at Shawa and Ambiri Kala respectively while TIV of herbs (146.78) and grasses (116.29) were found high in CPC and CRZ respectively (Table 29).

i. *Cymbopogon-Rhazya-Zizyphus community (CRZ)*

Cymbopogon-Rhazya-Zizyphus community established at Chokara. A total of 18 species were recorded in the site which consisted of 4 tree, 5 shrub, 6 herb and 3 grass species. The Importance value contributed by three dominants species i.e. *Cymbopogon jwarancusa, Rhazya stricta* and *Zizyphus maurtiana* was 145.25 while total importance value of 154.75 was provided by the remaining species. The

contribution by tree was 28.33, Shrubs 84.82, herbs 70.56, and grasses 116.29 (Table 41). The qualitative examination of biological spectrum showed that hemicryptophytes (6 spp., 33.33 %) dominated followed by nanophanerophyte and megaphanerophyte (4 spp., 22.22 %) each. In leaf size examination, microphyll (10 spp., 55.55 %) was the dominant class in this community. The community preferred to grow on high percentage of clay (49 %) and low amount of sand (47 %) and silt (4 %) particles. The soil of the community had better lime contents (12.3 %) with soil pH (7.26). The concentrations of P and K content were initiated in the range of 3.81 and 121 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.15 dS m^{-1} and 1.31 % respectively. The soil texture was found sandy clay (Table 3).

ii. *Cymbopogon-Saccharum- Zizyphus community (SCZ)*

This community was developed at Ambiri Kala. The dominated plant species on the basis of importance value were *Cymbopogon jwarancusa* (IV = 64.8) in herbs stratum, *Saccharum bengalense* (IV = 39.6) in shrubby stratum and *Zizyphus maurtiana* (IV = 10.8) in tree stratum. Other important species included *Astragalus psilocentros* (IV = 39.2), *Aerua persica* (IV = 36.4) and *Acacia modesta* (IV = 8.64). In this community, 18 plant species were recorded which composed of 4 tree, 6 shrubs, 4 herb and 3 grass species. The Importance value contributed by tree was 27.52, shrubs (IV = 103.72), herbs (IV = 63.08), and grasses (IV = 105.69) (Table 42). The qualitative biological spectrum examination of leaf size showed that microphyll (9 spp., 52.94 %) was the dominant class. In life form examination, hemicryptophytes (6 spp., 33.33 %) dominated followed by nanophanerophyte and megaphanerophyte (4 spp., 22.22 %) each . The community preferred to grow on high percentage of clay (51 %) and low amount of sand (46 %) and silt (3 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.34). The concentrations of P and K content were initiated in the range of 3.84 & 123 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.16 dS m^{-1} and 1.19 % respectively. The soil texture was found sandy clay (Table 3).

iii. *Fagonia-Rhazya-Zizyphus community (FRZ)*

FRZ community (*Fagonia-Rhazya-Zizyphus*) was structured at Takht-e-Nasrati and composed of 18 species. There were 3 tree, 5 shrubs, 8 herb and 2 grass species. The dominated plant species on the basis of importance value were *Fagonia cretica* (IV = 46.8), *Rhazya stricta* (IV = 40.4) and *Zizyphus maurtiana* (IV = 28.3). Other important species included *Withania coagulans* (IV = 15.1) in shrubby stratum, *Cymbopogon jwarancusa* (IV = 31.1), *Carthamus oxycantha* (IV=27.5), *Eragrostis poaoides* (IV = 26.4) in herbaceous stratum and *Acacia modesta* (IV = 5.53) in tree stratum. The Importance value contributed by tree was 37.72, shrubs (IV = 76.16), herbs (IV=120.73) and grasses (IV = 65.88) (Table 43). The biological spectrum showed that hemicryptophytes were the leading life form classes (33.33 %) followed by therophyte (28.77%). Mirophyll and leptophyll were the dominant leaf size classes represented by (44.44%) and (27.78 %) plant species respectively . The community preferred to grow on high percentage of sand (56 %) followed by clay (38 %) and silt (6 %) particles. The soil of the community had better lime contents (12.5 %) with soil pH (7.21). The concentrations of P and K content were initiated in the range of 3.72 & 117 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.18 dS m^{-1} and 1.23 % respectively. The soil texture was found sandy clay (Table 3).

iv. *Cleome-Phoenix-Capparis community (CPC)*

This community was developed at Siraj Khel. Dominant plant species on the basis of important values were *Cleome viscosa* (IV = 35.1) in herbaceous stratum, *Phoenix dactylifera* (IV=30.9) in tree stratum and *Capparis decidua* (IV = 24.7) in shrubby stratum. In this community 23 plant species were recorded which composed of 4 tree, 6 shrubs, 10 herb and 3 grass species. The Importance value contributed by tree was 46.79, shrubs (IV = 71.35), herbs (IV = 146.74) and grasses (IV = 35.04) (Table 44). The biological spectrum showed that therophytes was the leading dominant life form class (7 spp., 30.43 %) followed by hemicryptophytes (5 spp., 21.74 %). Mirophyll (11 spp., 47.83 %) was dominant leaf size class followed byleptophyll (6 spp., 26.09 %) and nanophyll (4 spp., 17.39 %) in the community. The community preferred to grow on high percentage of sand (53 %) followed by clay (45 %) and silt (2 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.93). The concentrations of P and K content were initiated in the range of 3.64 and 112 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.15 dS m^{-1} and 1.23 % respectively. The soil texture was found sandy clay (Table 3).

v. *Cenchrus -Cassia-Zizyphus community (CRZ)*

In Shahidan the *Cenchrus-Cassia-Zizyphus* community was established and dominated by *Cenchrus biflorus* (IV = 38.2) in herbaceous stratum, *Cassia angustifolia* (IV = 35.7) in shrubby stratum and *Zizyphus maurtiana* (IV = 25.2) in tree stratum on the basis of important values. Other important plant species with respect to Importance values were *Rhazya stricta* (IV = 33.9), *Withania coagulans* (IV = 23.8), *Fagonia cretica* (IV = 28.5) and *Acacia modesta* (IV = 8.62). A total of 15 plant species in the site composed of 3 tree, 4 shrubs, 8 were included in herbaceous stratum. The Importance value contributed by tree was 38.4, shrubs (IV = 100.3), herbs (IV = 112.38) and grasses (IV = 48) (Table 45). Therophytes (4 spp., 26.67%) was the

dominating life form class. Mirophyll (10 spp., 66.67%) had comprised leading leaf form class followed by leptophyll (3 spp., 20 %) . The community preferred to grow on high percentage of clay (51 %) followed by sand (43 %) and silt (6 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (6.89). The concentrations of P and K content were initiated in the range of 3.67 & 115 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.17 dS m^{-1} and 1.26 % respectively. The soil texture was found clay (Table 3).

vi. *Capparis -Aerua -Acacia community (CAA)*

Capparis- Aerua- Acacia community was composed of 20 species comprising 2 tree, 8 shrubs, 7 herb and 3 grass species at Zarki Nasrati. Importance value contributed by three dominants species i.e. *Capparis spinosa, Aerua persica* and *Acacia modesta* was 87.35 while total importance value of 212.65 was provided by the remaining species. The contribution by tree was 36.89, shrubs 97.9, herbs 119.91 and grasses 45.3. The associated species in herbaceous stratum included *Cynodon dactylon* (IV = 31.6), *Tribulus terrestris* (IV = 29.6) and *Fagonia cretica* (IV=23), *Saccharum bengalense* (IV = 12.2) and *Astragalus psilocentros* (IV = 12) in shrubby stratum. In tree stratum, the important species was *Zizyphus maurtiana* (IV = 15.9) (Table 46). The life form spectrum showed that hemicryptophytes (5 spp., 25%) was dominant life form class followed by therophytes and chemophytes (4 spp., 20%) each. Microphyll (11 spp., 55 %) was dominant group of the leaf size class followed by leptophyll (4 spp., 20 %) . The community preferred to grow on high percentage of sand (57 %) followed by clay (39 %) and silt (4 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.18). The concentrations of P and K content were initiated in the range of 3.71 & 114 mg Kg^{-1}. The community preferred EC and SOM in the range of 0.16 dS m^{-1} and 1.24 % respectively. The soil texture was found sandy clay (Table 3).

vii. *Boerhavia-Acacia-Capparis community (BAC)*

Boerhavia–Acacia-Capparis community was established at Shawa and is dominated by *Boerhavia diffusa* (IV = 50.5), *Acacia modesta* (IV = 41.2) and *Capparis spinosa* (IV = 34.3). Co dominant species included *Aerua persica* (48.21) in ground stratum; *Capparis decidua* (IV = 25.2) and *Withania coagulans* (IV=9.02) were making shrubby stratum. The associated species of he tree stratum included *Zizyphus maurtiana* (IV = 17.9). The community was composed of 12 species comprising of 3 tree, 5 shrubs and 4 herb species. The Importance value contributed by tree was 65.61, shrubs (IV=88.28) and herbs (IV = 146.10) (Table 47). Megaphanerophytes and chamophytes were the dominant class of the biological spectrum (3 spp., 25%) each. In leaf size classes, microphyll (8 spp., 66.67 %) followed by leptophyll (3 spp., 25%) . The community preferred to grow on high percentage of sand (63 %) followed by clay (32 %) and silt (5 %) particles. The soil of the community had better lime contents (12.4 %) with soil pH (7.41). The concentrations of P and K content were initiated in the range of 3.86 and 125 mg Kg^{-1}. The community preferred ECand SOM in the range of 0.16 dS m^{-1} and 1.28 % respectively. The soil texture was found sandy clay loam (Table 3).

b) Stand – 2 (600 – 699 m)

In stand 2, 4 communities i.e. *Zizyphus-Capparis-Phragmites* community (ZCP), *Aerua-Capparis-Zizyphus* community (ACZ), *Fagonia-Zizyphus-Saccharum* community (FZS), *Zizyphus-Aerua-Capparis* community (ZAC) consist of 36 plant species in which 6 trees, 11 shrubs, 15 herbs and 4 grasses were present in Kandu Khel, Shadi Khel, Sarki Lawager and Shnawa respectively. The highest number of herbs (7) and grasses (5) were present in ACZ and ZCP respectively. The highest TIV contributed by three dominant species is 132.56 present in ZAC at Shnawa while low (79.48) in FZS at Sarki Lawager. The highest TIV of trees (72.56), shrubs (IV = 97.73) were present in ACZ while herbs (IV = 107.59) and grasses (IV = 112.9) were present in FZS and ZCP respectively (Table 29).

i. *Eragrostis-Zizyphus-Capparis community (EZC)*

Eragrostis-Zizyphus-Capparis community was composed of 16 species included 2 tree, 7 shrubs, 5 herb and 2 grass species at Kandu Khel. The Importance value contributed by three dominants species i.e. *Eragrostis poaoides, Zizyphus maurtiana* and *Capparis decidua* was 132.79 while total importance value of 167.21 was provided by the remaining species. The contribution by tree was 50.94, shrubs (IV = 76.24), herbs (IV=103.36) and grasses (IV = 69.46). Other important plant species on the basis of important value were *Rhazya stricta, Astragalus psilocentros, Boerhavia diffusa* and *Cenchrus biflorus* (Table 48). The biological spectrum showed that hemicryptophytes and therophytes were the leading life form classes (4 spp., 25 %) followed by chamophytes (3 spp., 18.75%). Mirophyll and leptophyll were the dominant leaf size classes represented by 37.5 % and 31.25 % plant species respectively . The community preferred to grow on high percentage of clay (41 %) followed by sand (39 %) and silt (20 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.19 dS m^{-1}) and SOM (1.27 %) with soil pH (7.64). The concentrations of P and K content were initiated in the range of 3.78 and 119 mg Kg^{-1} respectively. The soil texture was found clay (Table 3).

ii. *Aerua-Acacia-Capparis community (AAC)*

This community was established at Shadi Khel. The dominated species on the basis of important value were *Aerua persica* (IV = 48.3) in ground stratum, *Acacia modesta* (IV = 24.3) in tree stratum and

Capparis decidua (IV = 23.5) in shrubby stratum. In this community 20 plant species were recorded which composed of 4 tree, 7 shrubs, 7 herb and 2 grass species. The Importance value contributed by tree was 56.72, shrubs (IV = 79.76), herbs (IV=133.05) and grasses (IV = 30.42) (Table 49). Hemicriptophytes were the dominant class of the biological spectrum (6 spp., 30 %) followed by megaphanerophytes (5 spp., 25 %). In leaf size classes, microphyll (9 spp., 45 %) were dominant followed by leptophyll (5 spp., 25 %). The community preferred to grow on high percentage of sand (57 %) followed by clay (38 %) and silt (5 %) particles. The soil of the community had better lime contents (12.4 %), EC (0.2 dS m^{-1}) and SOM (1.28 %) with soil pH (7.74). The concentrations of P and K content were present in the range of 3.71 and 128 mg Kg^{-1}. The soil texture was found sandy clay (Table 3).

iii. *Tribulus -Periploca -Zizyphus community (TPZ)*

The TPZ community (*Tribulus–Periploca-Zizyphus*) was established at Sarki Lawger. This community was supported by 19 plant species including 4 tree, 7 shrubs, 7 herb and 3 grass species. The Importance value contributed by three dominants species i.e. *Tribulus terrestris, Periploca aphylla* and *Zizyphus maurtiana* was 83.78 while total importance value of 216.22 was provided by the remaining species. The classes. The community preferred to grow on high herbs (IV = 138.49) and grasses (IV = 33.88) (Table 50). The life form spectrum showed that hemicryptophytes (5 spp., 26 %) was dominant life form class followed by nanophanerophytes and chamophytes (4 spp., 21.05 %) each. Microphyll (10 spp., 52.63 %) was leading group of the leaf form contribution by tree was 39.42, shrubs (IV = 88.2), percentage of sand (59 %) followed by clay (33 %) and silt (8 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.2 dS m^{-1}) and SOM (1.19 %) with soil pH (7.24). The concentrations of P and K content were present in the range of 3.79 and 109 mg Kg^{-1}. The soil texture was found sandy clay loam (Table 3).

iv. *Boerhavia-Zizyphus-Capparis community (BZC)*

This community was developed at Shanawa and composed of 11 species. There were 3 tree, 4 shrubs and 4 herb species Dominant plant species on the basis of important values were *Boerhavia diffusa* (IV = 61.84) in herbaceous strata, *Zizyphus maurtiana* (IV=42.6) in tree strata, and *Capparis spinosa* (IV = 34.93) in shrubby strata. The Importance value contributed by tree was 59.13, shrubs (IV = 78.82) and herbs (IV=162.05) (Table 51). Mirophyll was the dominant leaf size class represented by 8 plant species (72.73 %) and megaphenerophytes were the leading dominant life form classes (4 spp., 36.36%) . The community preferred to grow on high percentage of sand (56 %) followed by clay (37 %) and silt (7 %) particles. The soil of the community had better lime contents (12.5 %), EC (0.21 dS m^{-1}) and SOM (1.21 %) with soil pH (7.62). The concentrations of p and K content were present in the range of 3.69 and 131 mg Kg^{-1}. The soil texture was found sandy clay. Soil erosion was high resulted in low mineral composition in the soil (Table 3).

VI. Discussion

The investigated area comprised of 36 species in the 11 communities during summer. The environmental factors, habitat and different plant life determined communities' structure. Plants communities are useful in classification, naming and identification of plant life structure. Muller Dumbois & Ellenberg (1974) stated that plant community structure interpret and analyze the plant life at diverse revelation and offer immediate information regarding plant life and are origin for deduction of future alteration. Brinkmann *et al.* (2009) evaluated the plant life reaction to ecological situation of open woodlands along an altitudinal and animal palatability preference. The factors which influenced plant life structure are unplanted settlements, overgrazing, erosion, land sliding, habitat destruction, poverty and anthropogenic activities. In summer, 22 plant communities were identified at various parts of the investigated area at different altitudes. In summer, the plant number are limited due to unavailability of water and high temperature. The diverse plant communities documented in diverse seasons reflected different remains as recognized by Champion *et al.* (1965).

Soil is essential that has continued life on earth and it also helps the plants' growth that increased the competition of grazing animals and human. According to Turner *et al.* (2004) and Shameem *et al.* (2011) stated that the distinctive habitation altered due to increasing human transportation and population. Other progression results into increased the expected attack of organism has been happening the world over. Plant life changed the physical and chemical properties of soil. It improves the soil inliltration, structure and prevents erosion. Shameem *et al.* (2011) and Buckman & Brady (1967) described that the resources of soil is limited and its physical and chemical properties are restricted mostly by humus and clay. Several research works dealing with different features of plant life from diverse parts of the state have been taken out form time to time (Stewart, 1982; Dar *et al.*, 2001). The investigated area presents a limited number of animal and plant species. The investigated area is more suitable for the legume plant due the presence of high content of sand particles in the area. The mountains range present in the east of the consisted of sandy hills therefore it is called SHINGHAR (In local language Pashto; Shin: sand, Ghar: Hill). The water flow was occur from east to west due to altitudinal difference. Plant growth somewhat indirectly manipu-

lated through soil structure. It also effects the seedling growth which is very sensitive to physical condition of soil texture. The rigid compacted layer slows down the growth of the seedling for root cannot penetrate easily in such soil.

VII. Conclusion

The area still needs very detailed and comprehensive investigations regarding different vegetative attributes and their correlation with environmental as well as anthropogenic variables. A single study can not serve the whole purpose in such a large, diverse and geographically important area. Repeated and integrated explorations are recommended in all parts of Tehsil Takht-e-Nasrati to explore the dynamic and variations in floral biodiversity. Grazing practices need to be limited and monitored along with creating the awareness among the grazers about conservation and sustainable management of grasslands. Fenced vegetation plots should be designed at regular intervals to act as seed banks in whole Tehsil. Grazing practices should be synchronized with plant growth seasons so that damage to vegetation during flowering stage can be avoided. A great deal can be done about the ethnobotanical application of the local flora by identifying, investigating and evaluating the utilization practices of local folklore. The most important point to be considered is conservation of endemic flora, which has its restricted distribution in the study area and is posed with severe threats due to overexploitation by grazing, medicinal plant harvest and harsh environmental conditions.

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Table 2 : The number of species and share relative importance value of tree, shrubs, herbs and grasses among the different communities during summer of Tehsil Takht-e- Nasrati, District Karak

Stand	Sites	Communities	Total Species	Tree	Shrubs	Herbs	Grasses	TIV contribution by three dominant	TIV by remaining species	TIV by tree	TIV by shrubs	TIV by herbs	TIV by grasses
1	**As a whole**	**RCZ**	**34**	**6**	**12**	**13**	**3**	**63.98**	**236.02**	**40.11**	**88.9**	**112.48**	**58.39**
	Chokara	CRZ	18	4	5	6	3	145.25	154.75	28.33	84.82	70.56	116.29
	Ambiri Kala	SCZ	18	4	6	4	3	91.6	208.94	27.52	103.72	63.07	105.69
	Takht-e-Nasrati	FRZ	18	3	5	8	2	115.35	184.65	37.65	76.21	128.66	57.48
	Siraj Khel	CPC	23	4	6	10	3	90.69	209.31	46.79	71.35	146.78	35.08
	Shahidan	CCZ	15	3	4	6	2	99.1	200.9	38.4	100.3	112.38	48.92
	Zarki Nasrati	CAA	20	2	8	7	3	87.35	212.65	36.89	97.9	119.91	45.3
	Shawa	BAC	12	3	5	4	-	126.09	173.91	65.83	88.09	146.08	-
2	**As a whole**	**ZBC**	**29**	**6**	**11**	**9**	**3**	**84.41**	**215.59**	**51.55**	**80.76**	**134.24**	**33.44**
	Kandu Khel	EZC	16	2	7	5	2	132.79	167.21	50.94	76.24	103.36	69.46
	Shadi Khel	AAC	20	4	7	7	2	96.08	203.92	56.75	79.78	133.05	30.42
	Sarki Lawager	TPZ	19	4	7	7	3	83.78	216.22	39.4	88.2	138.5	3.9
	Shanawa	BZC	11	3	4	4	-	139.35	160.65	59.13	78.82	162.05	-

Table 3 : Physiochemical analysis of soil of Tehsil Takht-e-Nasrati, District Karak

Stand	Sites	Communities	PH (1:2)	EC dS m-1 (1:2)	Lime (%)	SOM(%)	P mg/Kg	K mg/Kg	Sand	Clay	Silt	Textural Class
1	Chokara	CRZ	7.26	0.15	12.3	1.31	3.81	121	47	49	4	Sandy Clay
	Ambiri Kala	SCZ	7.34	0.16	12.4	1.19	3.84	123	46	51	3	Sandy Clay
	Takht-e- Nasrati	FRZ	7.21	0.18	12.5	1.23	3.72	117	56	38	6	Sandy Clay
	Siraj Khel	CPC	7.93	0.15	12.4	1.23	3.64	112	53	45	2	Sandy Clay
	Shahidan	CCZ	6.89	0.17	12.4	1.26	3.67	115	43	51	6	Clay
	Zarki Nasrati	CAA	7.18	0.16	12.4	1.24	3.71	114	57	39	4	Sandy Clay
	Shawa	BAC	7.41	0.16	12.4	1.28	3.86	125	63	32	5	Sandy Clay Loam

	Average		7.32	0.16	12.4	1.25	3.75	118	52.1	43.6	4.3	Sandy Clay
2	Kandu Khel	EZC	7.64	0.19	12.5	1.27	3.78	119	39	41	20	Clay
	Shadi Khel	AAC	7.74	0.2	12.4	1.28	3.71	128	57	38	5	Sandy Clay
	Sarki Lawager	TPZ	7.24	0.2	12.5	1.19	3.79	109	59	33	8	Sandy Clay Loam
	Shanawa	BZC	7.62	0.21	12.5	1.21	3.69	131	56	37	7	Sandy Clay
	Average		**7.56**	**0.2**	**12.4**	**1.24**	**3.74**	**122**	**52.8**	**37.3**	**10**	**Sandy Clay**

Table 4 : The number of species and share relative importance value of tree, shrubs, herbs and grasses among the different communities during summer of Tehsil Takht-e- Nasrati, District Karak

S.No	Communities	CRZ	SCZ	FRZ	CPC	CCZ	CAA	BAC	EZC	AAC	TPZ	BZC
1	*Acacia modesta* Wall.	8.63	8.64	5.73	3.19	8.62	21	41.2	-	24.3	9.88	11.33
2	*Acacia nilotica* (L.) Delice	6.48	1.68	3.72	6.87	-	-	6.53	8.14	5.77	-	-
3	*Dalbergia sissoo* Roxb	3.38	5.53	-	-	-	-	-	-	4.24	-	-
4	*Gymnosporia royleana* Wall. ex M. A. Lawson	-	-	-	-	-	-	-	-	-	5.44	-
5	*Monotheca buxifolia* (falk) A.DC.	-	-	-	-	-	-	-	-	-	4.82	-
6	*Phoenix dactylifera* L.	-	-	-	30.9	4.66	-	-	-	-	-	-
7	*Prosopis juliflora* (Sw.) DC	-	-	-	-	-	-	-	-	-	-	5.177
8	*Punica granatum* L	-	-	-	-	-	9.75	-	-	10.1	-	18.84
9	*Zizyphus maurtiana* Lam	9.8	10.8	28.3	5.79	25.2	15.9	17.9	42.8	22.4	19.3	42.6
1	*Astragalus psilocentros* Fisch	-	39.2	-	3.66	-	12	11.2	8.29	16.2	-	-
3	*Calotropis procera* (Wild) R.Br.	-	3.72	-	8.64	-	1.8	-	5.26	7.04	9.63	-
4	*Capparis deciduas* (Forssk). Edge worth.	-	4.05	-	24.7	-	11.5	25.2	37.2	23.5	11.2	16.12
5	*Capparus spinosa* L.	-	-	-	-	-	33.6	34.3	-	-	-	34.93
6	*Cassia angustifolia* Vahl	-	-	-	-	35.7	-	-	-	-	-	-
7	*Periploca aphylla* Decne.	5.63	-	-	-	-	-	-	5.87	-	28.7	-
8	*Rhazya stricta* Dcne	60.3	11.3	40.4	15.4	33.9	5.72	8.53	11.9	12.8	10.2	8.933
9	*Saccharum bengalense* Retz.	6.53	39.6	10.3	-	-	12.2	-	4.04	3.7	-	-
10	*Saccharum spontaneum* L.	4.84	-	5.45	-	-	-	-	-	-	17.9	-
11	*Withania coagulans* (Stocks) Dunal	-	-	15.1	9.51	23.8	-	9.02	3.64	-	5.81	-
12	*Zizyphus nummularia* (Burm.f) W.&A	7.56	1.7	4.97	9.5	6.81	11.3	-	-	6.37	4.7	-
1	*Aerua persica* (Burm.f) Merrill	11.8	36.4	-	9.7	-	32.7	48.1	-	48.3	-	49.58
2	*Boerhaavia diffusa* auct plur.	13.3	6.29	5.89	3.25	11.1	5.33	50.5	32.4	7.58	20.6	61.84
3	*Carthamus oxycantha Bieb.*	-	4.21	3.93	7.56	11.5	12.9	19.6	-	17.9	-	27.51
4	*Cenchrus biflorus* Hook. f.	-	-	-	15.9	38.2	-	-	31.3	10.2	24.4	23.14
5	*Cleome viscosa* L.	5.61	-	-	35.1	-	-	-	-	-	-	-
6	*Cymbopogon jwarancusa* (Jones) Schult	75.2	26.9	31.1	8.87	-	4.9	-	-	7.85	13.6	-
7	*Cynodon dactylon* (L.) Pers	22.2	64.8	7.9	18.9	14	31.6	-	16.7	22.6	20.3	-
8	*Cyperus rotundus* L.	-	-	27.5	11.3	-	-	-	25.3	22.6	-	-
9	*Echinops echinatus* D.C.	-	-	-	-	-	11.1	-	-	-	17.1	-
10	*Eragrostis poaoides* Beauv	18.9	20.9	26.4	7.29	35	8.81	-	52.7	-	-	-
11	*Euphorbia prostrate* Ait.	-	-	8.92	18.9	-	-	-	-	-	-	-
12	*Fagonia cretica* L	16.8	-	46.8	33.4	28.5	23	-	4.81	-	20.3	-
13	*Salvia moorcroftiana* Wallich ex Benth.	-	-	21.9	-	-	-	-	-	-	-	-
14	*Solanum surattense* Burm .f.	14.2	-	-	7.55	17.5	5.33	-	-	12.3	20.4	-
15	*Tribulus terrestris* L	8.86	14.3	5.89	4.05	5.53	29.6	27.9	9.55	14.2	35.8	-

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Before start writing a good quality Computer Science Research Paper, let us first understand what is Computer Science Research Paper? So, Computer Science Research Paper is the paper which is written by professionals or scientists who are associated to Computer Science and Information Technology, or doing research study in these areas. If you are novel to this field then you can consult about this field from your supervisor or guide.

TECHNIQUES FOR WRITING A GOOD QUALITY RESEARCH PAPER:

1. Choosing the topic: In most cases, the topic is searched by the interest of author but it can be also suggested by the guides. You can have several topics and then you can judge that in which topic or subject you are finding yourself most comfortable. This can be done by asking several questions to yourself, like Will I be able to carry our search in this area? Will I find all necessary recourses to accomplish the search? Will I be able to find all information in this field area? If the answer of these types of questions will be "Yes" then you can choose that topic. In most of the cases, you may have to conduct the surveys and have to visit several places because this field is related to Computer Science and Information Technology. Also, you may have to do a lot of work to find all rise and falls regarding the various data of that subject. Sometimes, detailed information plays a vital role, instead of short information.

2. Evaluators are human: First thing to remember that evaluators are also human being. They are not only meant for rejecting a paper. They are here to evaluate your paper. So, present your Best.

3. Think Like Evaluators: If you are in a confusion or getting demotivated that your paper will be accepted by evaluators or not, then think and try to evaluate your paper like an Evaluator. Try to understand that what an evaluator wants in your research paper and automatically you will have your answer.

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5. Ask your Guides: If you are having any difficulty in your research, then do not hesitate to share your difficulty to your guide (if you have any). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work then ask the supervisor to help you with the alternative. He might also provide you the list of essential readings.

6. Use of computer is recommended: As you are doing research in the field of Computer Science, then this point is quite obvious.

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11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

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21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. Think technically: Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
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- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

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General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

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Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page
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· Keep on paying attention on the research topic of the paper

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· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

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· Shun use of extra pictures - include only those figures essential to presenting results

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Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

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The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.

- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
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This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
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- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

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- Do not present the similar data more than once.
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- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

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- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
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- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
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Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

INDEX

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