Negative Ion Variation during Evening Period (16:00-18:00) in the Sugarcane Area at the Rural Station Bhilawadi ($16^0 59' 20'' N, 74^0 28' 3'' E$).

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ABSTRACT. *We all live in the ocean of air ions. The atoms or molecules which loose or gain electrons become ions. They are charged and have electrical conductivity. In present study, we have measured positive and negative air ion concentration of sugarcane (Saccharum spp.) variety CO 86032 (NAYANA) which is a hybrid involving CO62198 and CO671.It is measured with the help of Air Ion Counter which is indigenously designed and developed at A.C.S. College Palus. The concentration of positive and negative air ions is measured particularly for sugarcane field at Bhilawadi ($74^0 28' 3'' E, 16^0 59' 20'' N$) area. Also measured pollution index which found below one which is good and healthier for human beings. These air ions play an important role in our daily life. Negative air ions have positive effect on humans and they are said to be as air vitamins. In sugarcane field, we found that concentrations of negative ions are large throughout the day as compared to concentration of positive ions. It may be due to ionization, photosynthesis and transpirations and radon exhalation process of sugarcane. This study of ion concentration measurement of sugarcane essential for health as well as cash crop for farmers economy. Inspite of taking help of articifial air ion generator,it is better to go in the vicinty of nature especially in Sugarcane field.*

KEYWORDS. Air ions, sugarcane, transpiration, Radon, Photosynthesis,

INTRODUCTION.

We are surrounded by positive and negative air ions. Radioactive materials, cosmic rays, ultraviolet rays. hydrolysis of water molecules, plant tip discharge, photovoltaic effect of green plants and physical processes such as volcanic eruptions, forest fires, lightning, thunderstorms, dust, snow storms are natural processes and corona discharge, water generation and radiation are artificial source of air ions (1).Now a days, people suffer from various sort of discomforts like fatigue, headache, insomnia, nervousness, joint aches, high blood pressure, decrease in the work productivity. It has been found that it happens due to presence of higher number of positive ions in the air where the person lives (2).The negative ions are useful , significant and source of energy for human body. Immune system and mental well-being is supported by them. We feel relaxed, happy and breathe easy due to them.it gives rise in good mood, better work productivity and peaceful sleep(3).Ions have antibacterial effects and may decrease the amount of microorganisms and allergens in the air (4). The life cycle of ion is about approximately 100 second.

According to the condition of neutrality the amount of ions found in the nature is always balanced (5).

$\sum n_i z_i = 0$

Where n- is the number of charges and z – is the charge number.

Diurnal and seasonal variations of air ions at the tropical place Pune noted that aerosol concentrations are high and air ion concentrations are low (6).Whereas, in Himalaya, it was observed that the concentration of aerosol particles is low and ion concentration is high (7). Air ion variation with respect to meteorological parameter at rural station Ramanandnagar showed that compared to all months October is healthier to human being and has lowest pollution index (8). The goal of this paper is to measure air ion concentration at rural station Bhilawadi (16.9789 n74.4731E) sugarcane field site and study effect of ion concentration on workers and farmer's life. The variety of sugarcane is Co 86032 (NAYANA) which is mostly cultivated in these area. It is hybrid involving Co62198 as female parent and Co 671 as male parent.

Generally, Ionization by cosmic rays and radioactive minerals is almost same in daily cycles but variation of air –ion concentration is attributed to changes of radon activity. In the lower troposphere (0-5km).radon is the most important generator of the air ions (9).This radon is water soluble. By transpiration, water from the plant body is lost in the surrounding atmosphere. Water absorbed from the soil is finally added in the surrounding atmosphere by this process. Thus, radon is responsible for formation of air ions. Sugarcane is crop which needs more water for its cultivation plays role in the formation of air ions.

MEASUREMENT AND METHODS

Our observatory at Bhilawadi (16.9789 n74.4731E) is located in rural and complete agricultural area of sugarcane Co 86032.It is 250 km southeast of Pune and 380 km southeast of Mumbai capital of Maharashtra, India. The Krishna river flows just 3.5 km to the northwest .A 10 feet road having average traffic of 2 to 4 motor vehicles in half an hour close to the observatory. The experimental setup is kept in the middle of Sugarcane area for the measurement of air ion concentration. Positive and negative air ions are measured for seven days with time resolution of 30 second and average ions were calculated from collected data between 17 Oct to 23 Oct 2018.

The pollution index is the ratio of number of negative ions to the number positive ions. For clean and clear atmosphere the is balance between them. If pollution index is higher than one then it is risky and density of aerosol is higher in the atmosphere. For healthy human life pollution index should be less than one (10).

INSTRUMENTAL DESCRIPTION

The instrument (small air ion counter) consists of a Gerdien condenser which is shielded from external fields by a coaxial cylinder fitted around the outer electrodes with Bakelite Spacers between them. Gerdien condenser is

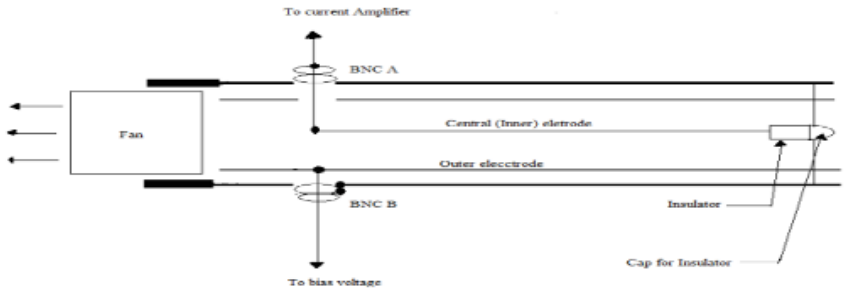

FIGURE1. *Schematic diagram of the Gerdien system in current measurement mode BNC B supplies the bias voltage, BNC A measures the ion current and its outer connection is driven by the current amplifier.*

FIGURE 2 Experimental setup

FIGURE 3 Sugarcane CO86032

The inner electrode is coaxially supported inside and outer electrode is supported with the help of Teflon legs which is good quality insulator with volume resistivity exceeding 1018 Ohm- cm (Keithley 1992). The condenser is made from brass sheet and chrome plate. A suction pump fitted at the end of coaxial structure is used to suck the air through condenser (11). By adjusting voltage of suction pump, air flow rate in the condenser can be varied. The air velocity in the condenser is measured with an air meter (Anemometer model AM- 4201) having accuracy of 0.005m/s. The central electrode is electrostatically separated from the fan by a non-magnetic stainless steel grid. The collecting electrode is at virtual ground potential because of very high input resistance of the femto ampere meter. An operational amplifier AD549JH was utilized for the conversion of initial current to the potential signal which is stored in data logger and in computer.

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The flow rate is (Ø) is given by

$$Ø = v\ \pi\ (r_o^2 - r_i^2)$$

Where r_o – radius of outer cylinder, ri – radius of inner cylinder

The air ion concentration (N) is given by

$$N = I / (e\ Ø)$$

Where I – Input current, e – charge on ion = $1.6 * 10^{-19}$C.

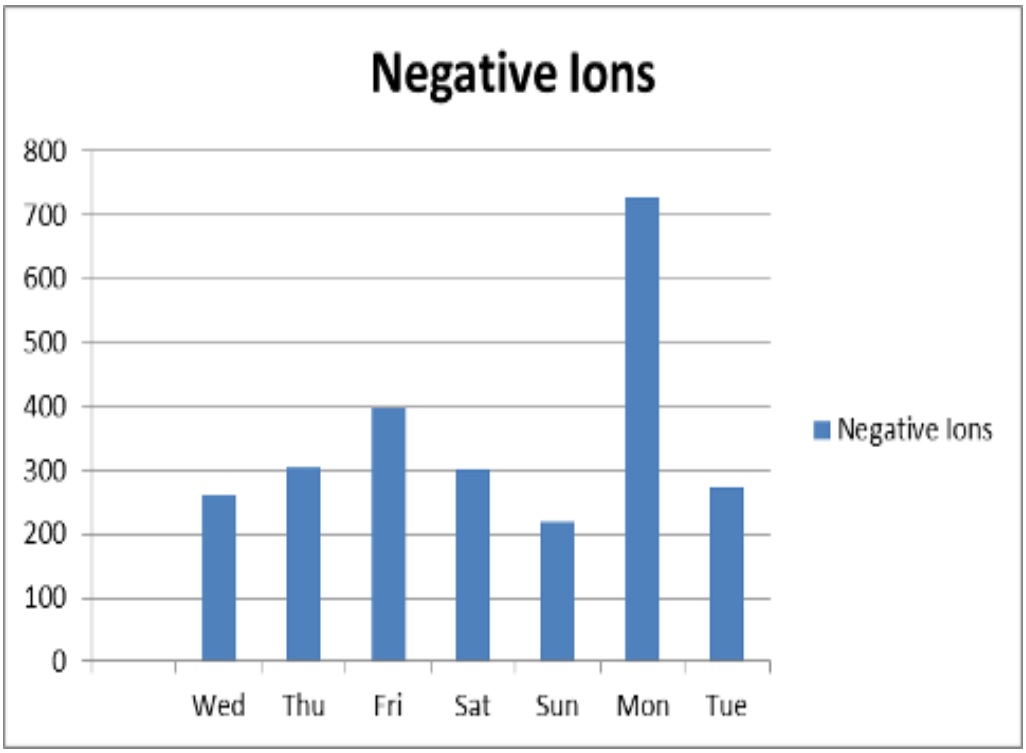
We can measure positive and negative air ion concentration by hanging polarity of outer cylinder.

RESULT AND DISCUSSIONS

We have measured air concentration of sugarcane CO86032 from Wednesday 17 Oct 2018 to Tuesday 23 Oct 2018. It is found that every day the concentration of negative ions is more than positive ions. The graph shows variation in the concentration of negative ions on Monday 22 Oct 2018 is due to thunderstorm and lightning. Subramania and Jagadesan 2014, measured air ion concentration in Pudukkotai district of Tamilnadu, India and found that the production of air ions during the occurrence of lightning and thunder (13).

The average value of negative ions is found to be 355 ions per cubic cm. The average value of positive ions is found to be 221 ions per cubic cm. The pollution index is 0.622 which shows that it is good for human health. The maximum count of negative ions is on Monday 22 Oct 2018 and is due to lightning and thunderstorm. The minimum count of negative ions is found on Sunday 21 Oct 2018 and is due to cloudy sky and humidity in the atmosphere. From Wednesday to Sunday the graph of negative ions increase, becomes maximum and again decreases. This is might be due to stomatal transpiration and radon exhalation.

During thunderstorm, lightning and raining temperature of atmosphere decrease and we fill easy and comfortable It is due increase in the concentration of negative ions. Sugarcane field is found to be rich in negative air ion concentration. During morning to evening even in the midnight we feel good due to presence of negative air ions. Really, negative air ions acts as air vitamins for human.



CONCLUSIONS

Sugarcane is cashcrop and suit for soil of Bhilawadi cultivational area Co86032 variety is mostly cultivated throughout the Bhilawadi region also it has more yield than other varities so sugar factory has also recmmonded it for more cultivation. This sugarcane is medium thick,reddish pink with prominent ivory marks on the internodes.The negative ion onentration during evening period (16:00—18:00) in the sugarcane area at the rural station Bhilawadi concludes that concentratio of negative air ions is more than positive ion not only at evevning period but also through out the day. Negative ions combines with pollutant and make it stable.They acts as aerosol remover. Pollution index for this week is 0.622. Thus October week was helthier for workers and farmers as compared drastic conditions of atmosphere.

It was the first attempt to to measure ion conentrations at rural areas directly in the cultivating area. Sugarcane area is natural shower of negative ions. Inspite of taking help of articifial air ion generator,it is better to go in the vicinty of nature.

We have measured air ion concentration of sugarcane area , further we have to measure air ion concentratoins of sugarcanes of different heights.Now our focus is on diurnal variation of air ions in sugarcane field at rural stations.

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