Effects of nh3 and other n deposited gaseous emitted biology essay

Environment

Chapter 2

2. 1 Introduction

Emission refers to the rate at which gases or particulates are being released into ambient air. Air emanations from domestic fowl farm consist of dust, particulate affair, olfactory properties, endotoxins, methane, H2S, CO2, and nitrogen-bearing compounds such as NH3.

However, NH3 emanations and N deposition can be a major beginning of pollution in hog and domestic fowl farm (Bouwman et al. , 1997 ; Hutchings et al. , 2001) .

In the UK, 80 % of NH3 emanations came from farm animal manure and N fertilisers (Sutton et al. , 1995 ; Asman, 1990) . These gases is usually transferred by moisture or dry deposition to tellurian workss and its surrounding (Asman & A ; van Jaarsveld, 1991) .

In the Europe, NH3 emanations have increased by more than 50 % over the last few decennaries (Sutton et al. , 1995 ; McCrory & A ; Hobbs, 2001) . 80 % of the annual emanations came from intensification of farm animal production (Pain et al. , 1998) , with 90 % out of it came from animate being wastes and fertilisers (Buijsman et Al. (1998) . In Netherlands, 85 % of the entire NH3 emanations originates from farm animal agriculture (Koerkamp et al. , 1998) .

While in Germany, 70-90 % of the entire NH3 emanations originated from animate being farm animal (Flaig and Mohr, 1996) . NH3 is a colourless gas, lighter than air and has a acrid order. The pungent gas is released during the

dislocation of the urea, excreted by hog and domestic fowl farm. Harmonizing to Koerkamp (1994) and Sutton et Al. (19998) , this reactive gas deposited and absorbed by land and H2O surfaces, normally near to where it was emitted (dry deposition) . In some instance, some ammonium hydroxide may make higher degrees in the ambiance and be blown long distances before being deposited in rainfall (wet deposition) . The greatest concentrations of ammonium-N in rain are found in the South and E of the UK where there are besides reported to hold a big figure of extended farm animal farm. Besides that, NH3 is extremely water-soluble and this gases is classified as particulate precursor – readily reacts with other substances in the ambiance to organize ammonium and other substances.

A substances comprised of ammonium hydroxide and ammonium are called decreased N, NHx. NH3 is emitted from the liquid as gas by a procedure volatilization. Animal waste are excrete as uric acid and so be broken down to urea (Figure 2. 1) . During this procedure, ammonium hydroxide are released by volatilization. Livestock manures are known to be the major beginnings of ammonia emanation. Ammonia emanations is increased by the usage of N in fertilisers or high protein diet in carnal provenders. If the N is non metabolized into carnal protein, the sum of N in droppings and piss will besides increased.

Figure 2. 1: Ammonia water flows in the ambiance, adapted from (hypertext transfer protocol: //www. defra. gov. uk/environment/quality/air/airquality/publications/ammonia/documents/

ammonia-in-uk. pdf) demoing the motion of NH3 through moisture and dry deposition.

Effectss of NH3 and other N gaseous to ecosystem community

NH3 and NH4 deposition in UK is presently above critical burden of N in many parts of UK including the highland and lowland heath, highland bog, semi-natural grassland and some forests. Over the last 20 old ages, many surveies have been conducted to give an grounds of rearward impact of N deposition (Wilson and Pitcairn, 1988 ; Fangmeier et al. , 1994 ; Sutton et al. , 1995 ; Pain et al. , 1998) .

An country of high NH3 emanations has been reported to change or alter species composing and finally altering the community ecosystem (Sutton et al. , 1993 ; Bobbink et al. , 1996 ; Van Dobben & A ; Ter Braak, 1998 ; Ruoss, 1999 ; Wolseley & A ; James, 2002) . Apart from violative smells emanating from husbandry unit, significant sum of NH3 besides causes inordinate N input (eutrophication) and acidification (Phillips & A ; Pain, 1998 ; Koerkamp et al.

, 1998 ; Wathes, 1998 ; Erisman et al. , 2003) . N deposition are known to caused elusive alterations of works species. In an country where works species are adapted to limited N, increasing N-deposition caused the native works to be outnumbered to those that requires higher concentration of NH3. Eutrophication increased the growing of workss booming on a limited N supply.

At the same clip, species that can non get by good with increasing N are replaced by N-loving species. Some surveies has shown an visual aspect of non-native species in semi-natural ecosystems. For illustration, some parts of heathland have been taken over by grass when N deposition additions.

The loss of moss-dominated heathland are besides reported to be reduced due to an addition of N. In footings of preservation, this state of affairs may take to loss of likely of import species. Harmonizing to Barkman (1958) and Brodo (1968) , ecological sequence can besides be reversed due to NH3 pollution. The domination of N-loving species (nitrophytes) at the disbursal of acidophytes or original flora (Pitcairn et al. , 1991 ; Sutton et al.

, 1993 ; Woodin & A ; Farmer, 1993) was more evident on acid-bark trees, where nitrophytes were reported to be absent or really rare. N deposition besides triggered works sensitiveness to emphasiss such as hoar, drouth and insect harm. Therefore this will besides lend to decreased stableness of works species. Besides eutrophication, NH3 emanations besides contribute to acidification of dirt and surface Waterss. NH3 was deposited on dirt, oxidized to nitrate and increases dirt sourness. Acidification begin when N and sulfur oxide compounds (NOx SOx) are converted to azotic and sulphuric acid.

These are substances in acerb rain formation. NH3 neutralized sulphuric acid and turned the droplet to ammonium bisulphate. However, this procedure merely go on if NH3 concentration is less than twice of the sulphuric acid.

If NH3 concentration is greater than twice the sulphuric acid degree, it will respond with other acerb bluess (Patterson & A ; Adrizal, 2005) . Since extra ammonia lead to serious environmental impacts, many European states such as the UK, Denmark, Sweeden and Germany have passed a ordinances restricting the degree of NH3 emanation from farm animal houses (Sommer et al. , 2009) . Under Gothenburg Protocol, participated states are committed to convey NH3 emanations within national ceilings (Angus et al.

, 2006) . Sensitive country (within 300 m from beginning) are classified harmonizing to their critical burden and are non permitted to increase their NH3 emanations when there are any alterations in production (Sommer et al. , 2009) .

Besides NH3, other N-gaseous emitted from hog and domestic fowl farm are NOx and N2O. Eventhough the impact of NH3 good documented, the consequence of other gases should besides be taken into consideration. NOx are known to trip ozone publicity and acid rain which caused the decease or diminution of forest in many parts of Europe. While N2O are the factor which contribute to ozone depletion (Williams et al. , 1992 ; Saggar et al. , 2004) .

N2O emanations are significantly contribute by solid manure tonss and N fertilisers (Bouwman, 1990 ; Williams et al. , 1992 ; Chadwick et al. , 1999 ; Jacobson et al.

, 2003) . N2O of course exists in the ambiance at a really low concentrations, approximately 310ppb. However, because N2O has 150 old ages of life-time therefore it lingers longer and the effects could be 300 two

tomes higher than of CO2 (Watson et al. , 1996) . Besides that, extra NH3 which settle on the dirt besides lending to the addition of N2O emanations (Bouwman (1990 ; Williams et al. , 1992 ; Granli & A ; Buckman ; 1994) . Williams et al.

, (1992) in his survey, concluded that N2O emanations was associated more to denitrification than that of nitrification. Even so, the prevalence of these two procedures as the dominant beginning of N2O production can be switched really quickly, depending on dirt belongingss, drainage in dirt, climatic belongingss and degree of organic content (Groffman, 1991 ; Saggar et al. , 2004) .

2. 1. 2 Effectss of N-deposition to lower workss

NH3 is an of import beginning for lower workss such as algae, lichen and nonvascular plants (Hansen et al. , 1997 ; Downing & A ; Rigler, 1984) . Lower workss such as epiphytic tellurian algae, lichen and nonvascular plants which do non hold waxen cuticle or pores are more prone to NH3 consumption in the surrounding compared to higher workss (Reiners & A ; Olson, 1984) .

The consumption of NH3 by lower workss are enhanced by wet and dew on the workss itself (ApSimon et al. , 1987) . There are several surveies describing the consequence of NH3 emanations to the flora of lichen (Barkman 1969 ; Hawksworth & A ; Rose 1970 ; Nimis et al.

, 1990 ; Sochting, 1995 ; Krupa, 2003 ; Wolseley et al. , 2006) and nonvascular plants (Beltman et a. , 1995 ; Kooijman & A ; Bakker, 1995 ;

Pitcairn et al. , 1995 ; Paulissen, 2004) . However, to the best of our cognition, there are no published study on the effects of ammonia emanations to epiphytic tellurian algae. Nitrogen and P have been determined as primary restricting foods to algal growing (Schindler, 1971) . Suppressed supply of N caused a diminution in algal growing but at the same clip, an extra NH3 can besides impact the denseness and diverseness of algae (Mangas-Ramirez et al.

, 2002) . Besides NH3, NOx which is responsible for the formation of acid rain, besides contribute to algal growing. When there is an inordinate supply of NOx, trees lose flowers and fruits before budding. Eutrophication in H2O organic structure due to extra N will lend to algal bloom. This phenomenon quickly depletes O in H2O organic structures and caused decease to big figure of algae.

Algal bloom caused by eutrophication have been prove lethal or toxic to algae (Handy & A ; Poxton, 1993) .

2. 1.

3 Hypothesiss

The current survey postulated that: N-deposition played an of import function in finding species diverseness, that N will advance the endurance of nitrophytes species and suppress acidophytes species. NH3 emitted from N beginning (livestock farm) as dry deposition are deposited locally and hence reduced in concentration at a really close distance from the farm animal farm.

2. 1. 5 Purposes and aims

The purpose of this survey are as follows: To asses the relation between distances from N beginning (hog and domestic fowl farm) to algal denseness. To find which pollutant has the most consequence on algal denseness. To look into whether either one or more N-gaseous drama their consequence on the growing of epiphytic algae.

The examine the function of facet and bark pH in impacting algal denseness. To entree the consequence of pollutants to bark pH.

2. 2 Materials and Methods

2. 2.

1 Site Descriptions

This survey has been conducted at a rural country in 200 estates farm located on the western side of the Windsor Great Park in Berkshire, south east England (Figure 2. 2) . The farm which is situated at the border of an intensely farmed irrigated part, has been developed since 1790s where extended agriculture and building of farm has taken topographic point (www. pastscape. org.

English Heritage memorial records) . It was used as a dairy unit so and merely after April 1997, the farm was converted to a hog and domestic fowl farm. This farm is dwelling of about 100 sows, 200 piggies, 650 agriculturists and 1200 poulets. These intensive farm animal farms emit strong odors of ammonium hydroxide.

The country is semi-arid with minimal average one-year temperature of 17. 8 0C upper limit of 23. 5 0C. Average one-year rainfall for this country is 12. 4 millimeter. Four sites along South-Westerly air current way were selected along a transect at 5 m, 35 m, 150 m downwind and 400 m upwind as a control site.

In each site, 3 Quercus robur (oak trees) trees were selected for biomonitoring. Figure 2. 2: Location demoing the hog and domestic fowl farm and 3 sites following the south western air current way. A= 5 m, B= 35 m, C= 150 m (downwind sites) , D= 400 m (weather as a control site) .

N Gaseous Monitoring

N gaseous monitoring was carried out to supervise the concentrations of NH3, NOx, NO2 and NO utilizing open-ended inactive diffusion tubing sampling stations supplied by Gradko UK. Tube sampling stations were foremost introduced by Palmes (Palmes et al, 1976) and have been widely used for many surveies (Bower at al.

, 1991 ; Campbell, 1988 ; Campbell et al. , 1994 ; Batty, 2003) . The tubings were designed for passively monitoring airborne gases and molecules.

They consist of an acrylic tubing and two closely fitted caps and little steel meshes between the tubing and the cap. Three replicate sampling stations were placed at each monitoring sites, at 1. 5m above land vegetations.

The sampling stations were left on the sites for 3 hebdomads. The sampling station contained filters impregnated with phosphorous acid which absorbs gas-phase NH3 as NH4, that can be easy measured spectrophotometrically

by the indophenol bluish method (Allen, 1989) . The average concentration of NH3 during the exposure period was calculated utilizing the exposure clip and ammonium content (Andersen et al. , 2006) . Detection bound of NH3 analysis was 0. 149 Aµg NH4. The degree of NH3 were subsequently obtained from ion chromatography with mention to a standardization curve derived from the analysis of standard ammonium solutions for NH3. The mesh phonograph record which detect NO2 were soaked in 50 % v/v triethanolamine (TEA) /acetone solution as an absorbent.

Nitrogen dioxide and its derived functions were analysed utilizing UV spectrophotometry. The concentrations of nitrite ions absorbed by the mesh were quantitatively determined by UV/visible spectrophotometry with mention to a standardization curves derived from the analysis of standard nitrite solutions. Limit of sensing for NOx and NO2 is 2. 71 ppb and 0.

10 ppb severally.

2. 2. 3.

Systematic Algal Collection

Systematic algae aggregation was carried out along line transect through the forest adjacent to the hog and domestic fowl farm, following the south western prevailing air current way. One control site at 400m upwind from the farm edifice and three sites at the downwind way has been set up. The downwind sites were at 5 m, 35 m and 150 m from the hog and domestic fowl farm. Three Quercus robur at each site were placed with 15 tens 15 cm quadrat, at 1. 5 m above the land, in line with inactive sampling stations. The quadrat were placed at 1300 SE, 2100 SW and 3100 NW. Algae within each

quadrat were collected by brushing the quadrat surface with a wetted cotton bud and so immersing it in a 20 centimeter specimen tube incorporating 40 milliliter distilled H2O.

Some algae were rather hard to take and a scalpel was so used to grate the algae from the bark of the tree. All samples were stored in a icebox at 1-4°C to forestall post-sampling growing. After vigorous shaking, 10 Aµl of the algal suspension was pipetted onto a microscope slide. A Brunel digital light microscope at 400 ten magnification was used to help designation and for numeration of algal cells. Scope Image Advance package was used to help in image capturing. An appraisal of denseness was made by multiplying the entire figure of cells in 10 Aµl, to that in 40 milliliter, to supply an estimation of algal denseness in one 225 cm2 quadrat. Speciess designations followed John et al. , (2003) ; Milow & A ; Aishah (2006) ; Lopez-Bautista et Al.

(2006) and database for the universe ‘ s algal listings (www. algaebase. org) . Photomicrographs of the algae were taken to ease designation.

Some ‘ difficult ‘ species were sent to Dr Fabio Rindi (National University of Galway) and Prof David John (Natural History Museum) for farther treatment and verification.

Bark pH analysis

Bark samples were collected beneath the quadrat used for algal aggregation. Bark samples were collected at 1m tallness from the base of the tree. Method for bark pH followed Kricke (2002) where 0. 5 g of the surface tree bark were land and soaked in phials with 10 milliliters deionized H2O. The phials were shaken smartly and left for 30 proceedingss, shaken in an

automatic shaker for another 20 proceedingss. Bark pH was measured with a Mettler Toledo MP 230 pH metre.

2. 2. 5 Data Analysis and Statisticss

Datas were analysed utilizing SPSS, MINITAB and R statistical package. Samples were tested for equal discrepancy utilizing Anderson-Darling normalcy trial.

The relationships between different variables were explored utilizing Pearson ' s correlativity coefficient and additive arrested development. ANOVA and t-test were used in many instances. Tukey ' s Pairwise Comparison was used to prove for differences between each sites. Non usually distributed informations was analysed utilizing Friedman trial which was utilizing ranking order, to look into the function of facet in impacting algal growing.

2. 3 Consequences

2. 3. 1 The relation between distances from beginning and algal denseness

Algal denseness is negatively correlated with distances from the farm (Pearson correlativity coefficient, R = – 0. 783, R = 88 % , P = 0. 003) .

Algae in the quadrat showed an obvious differences in footings of algal denseness across distance (Figure 2. 3) . In this survey, informations showed a important addition of algae nearer to the farm (1-way ANOVA, F3, 8 = 29.

54, P = 0. 001) . Number of algae are significantly higher nearer the beginning at 5m and 35m compared to other sites. Figure 2. 3: Variation in

algal denseness per milliliter across distances from the beginning (farm) . The values are the agencies A± SE bars.

Value with different missive indicates important differences at P & lt ; 0. 05. Data shows a clear decrease of algae at 150 m from the beginning. Algal denseness at this site are about on the same graduated table as in the control site (400 m upwind) .

Comparing between distances, the highest denseness of algae was recorded at 5 m from the farm with 3166 A±160 cells/ml. This was followed by a site at 35 m from the beginning with 2001 A± 397 cells/ml. Further off from the farm at 150 m, algal denseness were reduced drastically to 332 A± 287 cells/ml. As expected, the control site which was located 400 m upwind from the farm showed the lowest figure of algae at 194 A± 87.

9 cells/ml. Tukey ‘ s pairwise comparing was run to prove between sites. It showed that at 5m and 35m from the farm, no important different has been found between these two sites. The same state of affairs were found between site at 150 m and the control site. Therefore, informations was indicating to the point that sites located nearer to the beginning were found to be significantly higher to the 1s located farther off from the farm.

All information has been tested for normalcy and were found to be of usually distributed, utilizing Anderson-Darling Normality Test.

2. 3. 2 Pollutant Concentrations Emitted from the Farm

NH3 showed a clear decrease in footings of concentrations as the distances increasing (Figure 2.

4a) . NH3 concentrations were negatively correlated with distance from the farm and this is the lone pollutant which showed a clear decrease in footings of concentrations. At 5 m, NH3 concentrations was at 18. 34 A± 1.

38 Aµgm-3. The concentrations continue to diminish rather drastically at 35 m to 9. 72 A± 1. 69 Aµgm-3. At merely 150 m from the farm, the NH3 concentrations was about making the background informations at 5. 10 A± 1. 78 Aµgm-3. NH3 concentrations at the control site, which was located at 400 m upwind was 3.

74 A± 1. 11 Aµgm-3. Other atmospheric pollutants such as N dioxide, nitrogen oxide and azotic oxide fluctuates within distances but showed no obvious form (Figure 2. 4b-d) .

Figure 2. 4: Variations of Algal Density as a Function of Atmospheric Pollutants Across Distance From the Farm. a) Ammonia B) Nitrogen dioxide degree Celsius) Nitrogen oxide vitamin D) Nitric oxide

2. 3. 3 The relation between algal denseness and pollutant concentrations

Out of four pollutants tested in this survey, merely NH3 and NOx were found to hold a important correlativity with algal denseness (Figure 2. 5a and 2.

5c) . NH3 was found to hold a strong positive correlativity with algal denseness (p & lt ; 0. 001, R = 0. 912) .

NO2, while demoing a important correlativity, merely showed a mild positive correlativity to algal denseness (p & lt ; 0. 05, R = 0. 631) . Both NO2 and

NO were non significantly correlated to algal denseness (Figure 2. 5b and 2. 5d) .

Figure 2. 5: Correlations between algal denseness and atmospheric pollutants. a) Ammonia B) Nitrogen dioxide degree Celsius) Nitrogen oxide vitamin D) Nitric oxide

2.

3. 4 The Role of Pollutants in Affecting the Bark pH

Bark pH was positively correlated with NH3 concentrations (R= 0. 768, p= 0. 004) and negatively correlated with distance from the hog and domestic fowl farm (1-way ANOVA, F3, 8 = 13. 35, P = 0. 002) .

Bark pH ranged from 6. 12 – 6. 18 at 5 m and 35 m and so reduced to 4. 3 – 4. 5 at sites off from the farm (Figure 2. 6) . Tukey ‘ s pairwise comparing showed that there are no important difference between bark pH at 5 m and 35 m. Both of these sites were located near to the farm.

Similarly, sites farther off from the farm viz. site at 150 m and control site, besides showed no important different between the two. Figure 2. 6: Variations of bark pH in relation to distance. The values are the agencies A± SE bars. Value with different missive indicates important differences at P & lt ; 0. 05.

In footings of a relation between bark pH and pollutant concentrations, NH3 showed a positive correlativity while NOx showed a negative correlativity (Figure 2. 7a and 2. 7c) . NH3 was found to hold a strong relation with bark pH (p & lt ; 0.

05, R = 0. 768) . At the highest concentrations of ammonium hydroxide, bark pH reached up to about pH 6. 6. When the NH3 concentration was at the lowest concentration, bark pH tended to be more acidic, traveling every bit low as pH 4. 0 (Figure 2. 7a) . On the other manus, NOx showed a mild negative correlativity with bark pH (p & lt ; 0.

05, R = -0. 587) . Bark pH were more acidic at higher concentrations of NOx as compared to take down concentrations (Figure 2. 7c) . NO2 and NO showed no important correlativity with bark pH (Figure 2. 7b and 2. 7d) .

Figure 2. 7: Correlation between bark pH and atmospheric pollutants. a) Ammonia B) Nitrogen dioxide degree Celsius) Nitrogen oxide vitamin D) Nitric oxide

The function of Aspect in Affecting Algal Density

The superior order of algal denseness in relation to facets is 2100 SW & gt ; 1300 SE & gt ; 3100 NW. Algal denseness were highest at 2100 SW with 1445 A± 377 cells/ml and lowest at 3100 NW with 1383 A± 384 cells/ml (Figure 2.

8) . Entire figure of algae in the quadrat at 1300 SE was 1442 A± 430 cell/ milliliter. Eventhough there are differences in footings of algal denseness between facets, the difference was non statistically important. Therefore, this peculiar survey showed that facet does non impact algal denseness (p= 0. 779, S= 0. 50) . Data were analysed utilizing Friedman Test for non-parametric informations.

Figure 2. 8: Variations of algal denseness in relation to facets.

2.

4 Discussions

2. 4. 1 Algal Density Within Close Proximity of Pollutant Source

Algal denseness were found to be higher in figure, closer to the beginning of pollutants (Figure 2. 3) . A strong positive correlativity between NH3 and algal denseness explains the relation between these two entity (p & lt ; 0. 001, R = 0. 912) . As concentrations of NH3 additions, algal denseness were besides increasing (Figure 2.

5a) . There are 72 % decrease at 150 m from the beginning, and 80 % at 400 m from the beginning. Fowler et al. , (1998) reported a decrease of 98 % in the first 200 m from the beginning and Pitcairn et Al. (2002) reported a crisp lessening in the first 200 m and 95 % decrease at 650 m from the beginning. The figure of algae were highest when the NH3 concentrations were at its extremum as dissolved inorganic N such as ammonium hydroxide, nitrate and nitrite normally impacting the distribution, productiveness, and copiousness of algae (Ryther and Dunstan, 1971 ; Nelson et al.

, 2003 ; Thornber et al. , 2008 ; Pinon-Gimate (2009) . Increased degrees of N with diminishing distance from the hog and domestic fowl farm (Figure 2a) is in understanding with Kauppi (1980) , Pitcairn et al. , (1998) , Sochting (1995) , Ruoss (1999) and Vingiani (2004) . Higher N concentrations often increase the rate of agal growing (Doering et al.

, 1995 ; Harlin, 1995 ; Taylor et al. , 1999 ; Thornber et al. , 2008) . The background informations at 400 m upwind is 3. 74 Aµgm-3. This is in perfect understanding with a work carried out in Netherlands by Buijsman et al. , (1998) where average concentrations in background informations ranged from 2-4 Aµgm-3. This is about similar to parts with agricultural activities in the UK, Austria and Switzerland.

Sutton et al. , (2001) , Loflund et al. , (2002) and Thoni et al. , (2004) nevertheless reported a lower one-year mean NH3 concentrations of & lt ; 1 Aµgm-3 in parts without agricultural activity. This information explained the mono-species of algae found on trees environing the farm. The hypothesis is Desmococcus sp. is nitrophytic species and because NH3 concentrations are high, other algal species could non go on to last or hold a less version therefore cut downing in figure.

Finally, Desmococcus sp. outgrown other algal species due to high NH3 concentrations. Unsurprisingly, there are no other species of algae in the quadrat but the nitrogen-loving algae, Desmococcus olivaceus. High NH3 ensuing in nitrophytic species was besides suggested by new wave Herk (1999) . Pitcairn et Al. (1998) who speculate that an country with high N deposition will ensue in nitrogen-tolerant species and deficiency of N sensitive species.

Besides, they observed that species composition within 50-300 m of the emanation beginning is adversely affected. Most of the species found within close locality of the beginning are ‘ weed species ‘ and species figure is reduced. Desmococcus olivaceus which is known as nitrophilous species

were abundant within close propinquity to the domestic fowl and hog farm. Harmonizing to Sparrius (1970) , nitrophilous air plants are positively correlated with NH3 and at the same clip, decreases acidophilus air plants. In present survey, NH3 concentrations near to the farm was 18 times higher than the critical degree (1Aµgm-3) .

Critical degree is defined as the concentration in the ambiance above which direct inauspicious effects on receptors such as workss, ecosystems or stuffs, may happen harmonizing to present cognition (Posthumus, 1988) . Compared to other nitrogen-bearing gaseous, NH3 is the chief beginning of dry deposition of atmospheric pollutants within close locality to husbandry unit (van Herk, 2003 ; Frati et al. , 2008) . NH3 concentrations at the closest station to the beginning (5 m) was highest compared to other Stationss (35 m, 150 m, command site) at 18. 34 A± 1.

38 Aµgm-3. In line with the theory, figure of algae at this station were found to be the highest at this point with 3166 A±160 cells/ml (Figure 2. 4a) . As NH3 was reduced to 9. 72 A± 1. 69 Aµgm-3, algal denseness besides decreases to 2001 A± 397 cells/ml.

No important different between algae at these two distances (5 m and 35 m) . However, a important consequence has been found between Stationss near to the beginning (5 m and 35 m) and farther off from the beginning (150 m and control) . This consequence showed that at a distance below 35 m, NH3 concentrations are still significantly higher and therefore lending to the overall algal denseness within these distances. Since NH3 administer really rapidly into the air within a short distance, algal denseness were found

to diminish consequently. Fowler et Al. (1998) and Sommer (2009) besides observed the same form where NH3 concentrations decline aggressively at increasing distances from the pollutant beginning.

Observation made by Fowler et Al. (1998) showed that 60 % of NH3 emitted from the farm was deposited within 50 m and was closed to play down NH3 concentrations at merely 276 m from the beginning. This is in understanding with the work carried out by Skiba et Al. (2006) where they observed an addition of NH3 concentrations up to 40 times, nearer the beginning as opposed to the background site. At 150 m from the farm, algal denseness were significantly lower than at 5 m and 35 m (Figure 2. 3) . With NH3 concentrations dropped to 5. 10 A± 1.

78 Aµgm-3, algal denseness was diminishing to 332 A± 287 cells/ml (Figure 2. 4a) . Interestingly, algal denseness at 5 m and 35 m showed no important difference with the algae collected at the control site.

Located 400 m upwind from the farm, with no or small consequence of NH3, algae at the control site were merely 194 A± 87. 9 cells/ml (Figure 2. 3) . It showed that at merely 150 m from the beginning, there are merely a small consequence of NH3 in impacting the growing of algae. This determination is in line with a research conducted by Sommer et Al. (2009) which concluded that at 150-200 m from the pollutant beginning, the farm was merely marginally affected by NH3 emitted from the poulet farm.

Apart from NH3, other N-deposited gaseous emitted from the farm merely showed a mild fluctuation between the distances (Figure 2. 4b-d) . No

evident form were observed for NO2, NOX and NO. These gaseous were besides found non to hold any important relation to the figure of algae, except for NOx (Figure 2.

5c) . Though merely demoing a mild positive correlativity (p & lt ; 0. 05, R = 0.

631) , the consequence of NOx is thought to hold an consequence on algal denseness. Harmonizing to Sutton et Al. (1993) , countries of high deposition has faced a alteration in flora due to increased deposition. Eutrophic works species was found to increase at the disbursal of oligotrophic species.

2. 4.

2 Effectss of Bark pH and Aspect in Affecting the Algal Density

Pollutant concentrations particularly of NH3 are believed to play a function in finding the bark pH (van Herk, 2003) . In this survey, pH ranged from 4. 3 to 6.

2. Barkman (1958) reported in his work that typical pH scope for Quercus sp. is between 3. 7-5. Van Herk (2001) reported a somewhat different pH scope, from 3.

7-4. 4 in forest environment, 3. 8-5. 0 in urban countries and 5. 6-6.

4 in intense agricultural countries. As the NH3 concentrations increased, the pH besides increased (Figure 2. 7a) . Closer to the farm where NH3 concentrations was highest, bark pH was at the highest every bit good.

Traveling farther off from the farm where NH3 concentrations was the lowest, value of bark pH was besides at the lowest point (Figure 2. 6) .

Higher denseness of algae closer to the farm are as a consequence of the pH. Higher pH provide better environment for algal growing. Green algae usually turn better at a higher pH. Moss (1973) stated that green algae Desmidium swartzii would non last when pH is less than 4. Long exposure of NH3 promotes nitrophilus species of lichens and this were chiefly due to lifting bark pH, particularly within 2-3km from the pollutant beginning (van Herk, 2001 ; van Herk et al. , 2003) . Due to alkaline belongingss in NH3, the pH increased and finally helped in switching the species composing (van Herk, 2001) .

The growing of lichen and nonvascular plants are known to be affected by facet or orientation (Plitt & A ; Pessin 1924 ; Barkman 1958) . This is due to the fact that orientation will impact sum of light received by lichens and nonvascular plants. Besides, facets are impacting humidness, which known to favor the growing (Ferris-Kaan, 1995 ; Ferris and Carter, 2000) . However, Buckley et al. , (1997) stated that light strength does non needfully hold strong influences on flora. In northern temperate countries, lichen are normally higher on the northern side of trees where the country are shielded from direct sunshine therefore having less strength of visible radiation (Barkman, 1958 ; Brodo, 1973 ; Stubbs, 1989 ; Ferris & A ; Carter, 2000) . In current survey, higher figure of algae were on the southwest side of the tree. The same decision was derived by work from Gomez, (1985) .

Harmonizing to Barkman (1958) and Rubiano (1988) , lichen coverage are higher when it is protected by local air current. In this instance, eventhough southwest country of the tree has direct consequence of the air current, the figure of algae are higher due to higher NH3 concentrations brought approximately by the air current. Harmonizing to Hylander (2005) who studied the consequence of facets on nonvascular plants in boreal wood, there was a important consequence between bryophtes on the North and South. He concluded that the north-facing nonvascular plants have less per centum of nonvascular plants decline compared to the south-facing nonvascular plants.

In this survey, algae at different angle of the tree showed no important different with the facets (Figure 2. 8) . Eventhough there were a higher figure of algae at 2100 SW compared to other facets, the difference were non statistically important. This hypothesis is that the trying site is the homogeneous type, therefore allowing about the same sum of visible radiation and sunglassess between trees irrespective of their location.

Marques et Al. (2004) besides reported that lichen transplanted confronting the air current and shielded from the air current do non differ and therefore concluded that orientation do non play a important function in their survey.

Decisions

This survey are following the forms of many other surveies carried out at farm animal farm over the past two decennaries, measuring the engagement and consequence of atmospheric pollutants from farm animal farm to the next country. The hypotheses that N-deposition played an of import function

in finding species diverseness was proved to be right from the consequences presented from this current work. N deposition was found to help a healthy growing of Desmococcus olivaceus, the lone dominant algal species available in the sites. The bing of merely one dominant species of epiphytic algae on Quercus robur within close propinquity of the farm might indicating us to the right way – that high N deposition are lending to nitrophytes species and may change community ecosystem.

It is believed that other algal species could non digest high N and had been suppressed by N booming species such as D. olivaceus. In other words, high N content in the ambiance and the surface triggered the endurance of nitrophytes species and suppressed acidophytes species. As the figure of algae decreased are positively correlated with the distance from the farm, NH3 has been treated as the chief pollutant which impacting the algae. Although other gaseous such as NOx besides demoing a positive correlativity but the consequence of NH3 are really important that we could about see NH3 as the major factor impacting the figure of algae in this country.

In footings of preservation attempt, attending should be paid to an country of high N to forestall farther loss to algal species which could non boom in an country of high N. This measure will besides forestall community alteration within close propinquity of hog and domestic fowl farm.