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DISCOVERING THOUGHTS AND INVENTING FUTURE

HIGHLIGHTS

Behaviour of Bifenthrin

Shelflife of Cookies

Assessment of Epiphyte

Behaviour of Pigeons

Yellow Jellyfish

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Effect of Curry Spice (*Murraya koenigii*) on the Shelflife of Cookies (Biscuit) Produce from Sorghum Flour Blends with Wheat Flour

By Giwa Oluwamodupe Emmanuel, Onileke Francisca Omolara & Oyetayo Adedayo Michael

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Abstract - Melon flour was blends with Wheat flour in the following ratio 100:0, 70:30,50:50, 30:70,0:100 and each categories were spiced with ginger (*Zingiber officinale*) at concentration of 5g and 10g respectively. The effect of spice (*Zingiber officinale*) at both concentration (5g and 10g) on the physical properties height, diameter were determined for all categories using meter rule and then spread factor was calculated to range from $2.8X10^2$ to $14.8\ X10^2$. Microbial evaluation was carried out on the prepared cookies. Total Viable Count, Total *Staphylococcus* count, Total *Bacillus* count and Total coliform count were determined using selective media. These were comparing to microbiological specification for baked cookies. The effect of the spice *Zingiber officinale* at both concentrations on the microbial load reveals a significant difference as increase in the spice concentration led to decrease in microbial load.

Keywords : *Microbial Load, Organoleptic Properties, Shelf Life.*

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Keywords : Microbial Load, Organoleptic Properties, Shelf Life.

I. Introduction

Baking is a food cooking method using prolonged dry heat acting by convection and not by thermal radiation, normally in an oven. Baking is the process of using food ingredients and formulas, or recipes to cook food or bake a food product.It is primarily used for the preparation of bread, cakes, pastries and pies, tarts, quoches cookies and crackers (Mridula *et al*, 2007). Biscuits are ready-to-eat, cheap and convenient food product that is consumed among all age groups in many countries (Hussein *et al,* 2006; Iwegbue, 2012). Biscuits have been reported to be rich in fat and carbohydrate; hence they can be referred to as energy giving food as well as good sources of protein and minerals (Kure *et al*, 1998). The main ingredient generally used for biscuit production is wheat flour with other ingredients such as margarine (shortening), sweeteners (sugar), leaving agents, eggs, milk, salt and flavours (Ghattas *et al,* 2008). In many parts of sub-Saharan Africa and most especially Nigeria, advancing prosperity and urbanization couple with tremendous increase in population. In recent years have led to an increase in the consumption of wheat-based products especially biscuits and breads. However, the production of wheat in Nigeria is extremely low far below domestic requirements.

Wheat flour is a powder made from the grinding of wheat used for human consumption. Wheat flour is the most common flour used in baking different between bread flour and cake flour. Wheat protein is easily digested by nearly 99% of human. So is its starch. Wheat also contains a diversity of minerals, vitamins and fats (lipids). With a small amount of animal or legume protein added a wheat-based meal is highly nutritious. Sorghum is one of the crops grow in many African countries primarily as food crop with less than 5% of the annual production commercially processed by the industry (Rohrbach and Kiriwaggulu, 2008; Okoli *et al*, 2010). Sorghum grain ranks third among the domesticated cereals for human consumption and is a staple food in many African countries, India and China (Elkhalifa and El-Tinay, 2002; Awadalkareem *et al,* 2008; Elemo *et al*, 2011; Mohammed et al, 2011).

Curry power *Murraya koenigi* is a spice mixture of widely varying composition developed by the British during the days of the Indian Cuisine at home. Curry powders and pastes produced and consumed in India are extremely diverse, some red, some yellow, some brown, some with five spices and some with as many as 20 or more. Besides the previously mentioned spices, other commonly found spices, white pepper, ground mustard, ground ginger, cinnamon, roasted cumin, cloves, nutmeg, mace, green, cardamom seeds or black cardamom pods, bay leaves and coriander seeds (Adebowale *et al,* 2008).

Shelf life is the recommendation of time that products can be stored, during which the defined quality of a specified proportion of the goods remains acceptable under expected condition of distribution, storage and displays. Most food products shelf life are increased using preservative – A preservative is a naturally occurring or synthetically produced substances

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e.g. (salt) that are added to product such as foods, pharmaceutical paints, biological samples, woods etc. to prevent decomposition by microbial growth or by undesirable chemical changes (Gyesley, 2008).

The present work aimed to know the effect of spices *Murraya koenigi* shelf life of biscuit produced from blends of sorghum flour and wheat flour.

II. Materials and Method

a) Collection and Processing of Raw Materials and Baked Products

sorghum and wheat was collected from a local market Oja-Ikoko, in Owo Town, Ondo State and the dirt's, stones and other extraneous material was picked and the wheat was grinded using a laboratory hammer mill to pass through a 0.4mm screen (Elkhalfa and El-Tinay, 2002) and pulverized. Bakery products, sugar, eggs, margarine, milk and salt were also gotten from the same market.

i. *Preparation of Composite Flour and Cookies (Biscuit)*

Ten composite flours was prepared by substituting melon flour and wheat flour with 5g and 10g of Curry power *Murraya koenigi* in the blends proportion of 100;0, 70;30, 50;50, 30;70, 0;100 for 5g and 10g respectively. Biscuit was produced from the composite flours and spices according to the method of Giwa *et al* (2012).

ii. *Physical Analysis of the Biscuit*

The diameter and height of the biscuit produced was measured with a calibrated ruler as described by (Opawale *et al*., 2011, Giwa *et al*., 2012).

iii. *Microbial Evaluation of the Biscuit*

Microbial count was determined according to standard method described by (Giwa *et al*., 2012, Umoh *et al*., 2004, Onuorah and Akijede 2004). This microbial analysis was carried out immediately after production and two weeks interval to the storage times of six weeks.

iv. *Sensory Evaluation of the Biscuit*

The organoleptic evaluation of the biscuit sample was carried out for consumer acceptance and performance using five trained panelist (student and staff of the Department of Science Laboratory Technology, Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria) (Opawale *et al*., 2011). This sensory analysis was carried out immediately after production and two weeks interval to the storage times of six weeks. The result was recorded in triplicate ± standard deviation, and analyzed using statistical tool t-test and Duncan to separate the means.

III. Statistical Analysis

The value of result was obtained in duplicate and was used to calculate the mean ± standard deviation. The data obtained were statistically analyzed using studentize t-test and analysis of variance (ANOVA).

IV. Discussion

The physical analysis of biscuit produced from blends of sorghum flour and wheat flour spiced with curry *(Murraya koenigii)* show in table 1 revealed a corresponding increase from 5g to 10g. This observation is contrary to the result of Oluwamukomi *et al*, 2005, who observed decrease in spread ratio. The increase in the spread ratio with increase in spiced concentration shows that the starch polymer molecules are loosely bond with granules and swelling is not limited with wheat flour when heated. The increase in the concentration of wheat flour revealed increase in the spread ratio.

Table 2, 3 and 4 below shows the microbial count of the produce cookies at immediately after production, two weeks after and five week after production respectively. Increase in the spice concentration induced a noticeable reduction in the microbial load. The total microbial load on nutrient range from 6.0×10^4, 4.0×10^4 and 1.0×10^4 Cfu/g. This result compare with microbiological standard of blend foods is within satisfactory acceptable range $<10^5$ (NZFSA, 2005). The result is still within acceptable value. Significant reduction in the total viable count of the microbial isolates on nutrient agar was attributes to increase in the concentration of the spice (*Murraya koenigii*). It has been recorded that, *Murraya koenigii* has antimicrobial properties (Ningappa *et al*., 2008). The corresponding increase in the spice (*Murraya koenigii*) concentration also leads to corresponding decrease in *Staphylococcus counts* at each category respectively and the results fall into the microbiological specification for *Staphylococcal* count ranges form ($10^2 - 10^3$) at the concentration of 5g and 10g respectively. The result for staphylococcus count for 70:30, 50:50 and 30:70 sorghum flour-Wheat flour reveals count within the marginally acceptable range compare microbiological specification ($10^2 - 10^4$) (NZFSA, 2005). Coliform count reveals no growth on Eosin Methylene Blue agar (EMB) for all the blends. This show that the raw material before and during production are free for feacal contamination. The table of the biscuit stored for three weeks shows that the bioload are within the acceptable range and there was no significant difference on microbial load compared with biscuit produce immediate after production at probability level $P<0.05$ but there was a noticeable increase on the bioload of the biscuits at the storage period of 6 weeks. This show that the application of curry *(Murraya koenigii)* as a noticeable effect on the microbial load produce from sorghum flour and wheat flour blend as it keep the microbial load below microbiological below the standard.

Sensory evaluation of biscuit produced from sorghum flour blend with wheat flour spiced with curry (*Murraya koenigii*). The organoleptic evaluation of biscuit show in table 5,6 and 7 revealed that there were no significant different on the sensory property at probability level $P<0.05$ using student T-test to compared the mean of the result of concentration of 5g and 10g of curry spice immediately after produced. This implies that spice concentration can still be increased for further antimicrobial effect to be exacted without having effect on the sensory property of the produced biscuits. Following storage, every two weeks intervals there was no much difference on the sensory property and overall acceptability for 6weeks. This could implies that the spice impact on a longer shelf-life on the produced product as the biscuit retain its sensory property over a particular period of storage time. The colour of biscuits changes from creaming to dark brown with the increase in the trends of sorghum flour. Taste is the primary factor that determines the acceptability of a product which as the highest impact as far market product is concerned (Banureka and Mahendran, 2009). The score of taste for six weeks of storage period ranges from 3.0-5.0 i.e. from neither like nor dislike to extremely liking. The cripiness was related to the external appearance of the biscuit top which smoothness or roughness of crust. The texture crust for six week of storage revealed no significant different. The overall acceptability also revealed there is no significant difference from the data collected as the spice increase from 5g to 10g concentration, using T-test as the statistical tool to analyze the differences.

V. Conclusion and Recommendation

Sorghum is one of the useful food crops that contain important nutrients for man and his livestock. Wheat flour is the most common flour used for human consumption. The present of the spice (*Murraya koenigii*) in the finished cookies products produces significant effect on microbiological load. This could be attributed to the increase in the concentration of the spice (*Murraya koenigii*) that lead to satisfactory acceptable range in the microbial load in all the categories. It can be controlled that the spice (*Murraya koenigii*) produced no significant effect on the physical properties as the diameter, height and spread factors varied significantly, at probability level $P < 0.05$ as concentration of the spice (*Murraya koenigii*) increase. It can also be concluded that, there is no significant difference on the effect of the spice (*Murraya koenigii*). On the sensory properties of cookies produced from sorghum flour fortified with wheat flour as the spice concentration increase. It can there be recommend that the production of cookies from sorghum flour fortified with wheat flour spiced with curry (*Murraya koenigii*) be encouraged to achieve and harvested the preservatives potential of the spice (*Murraya koenigii*) and the other medicinal properties that has been recorded from literature review.

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Table 1: Physical Analysis of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spiced with Curry (*Murraya koenigii*).

SF:WF 100:0%	DIAMETER	HEIGHT	SPREAD FACTOR
5g	4.5	0.5	0.9 x 103
10	4.2	0.5	0.84 x 103
70:30%			
5g	3.6	0.6	0.6 x 103
10g	4.2	0.5	0.84 x 103
50:50%			
5g	6.3	0.5	1.26 x 103
10g	3.2	0.6	0.5 x 103
30:70%			
5g	6.2	0.4	1.55 x 103
10g	6.2	0.4	1.55 x 103
0:100%			
5g	4.5	0.4	0.9 x 103
10g	4.2	0.4	0.84 x 103

Table 2 : Microbial Preparation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spiced with Curry (*Murraya koenigii*) immediately After Production.

Sorghum Flour: Wheat Flour	Spice concetratior	A	B	C	D	E	F
100% SF:	5g	$2.0x10^3$	Nil	$2.5x10^3$	$1.0x10^3$	$7.0x10^3$	Nil
0% WF	10g	$1.2x10^3$	Nil	$7.0x10^3$	$1.1x10^3$	$4.0x10^3$	Nil
70% SF:	5g	$1.0x10^3$	$7.5x10^3$	Nil	Nil	Nil	Nil
30% WF	10g	$2.0x10^3$	$3.0x10^3$	Nil	Nil	Nil	Nil
50% SF:	5g	$9.5x10^3$	$1.1x10^3$	Nil	Nil	$3.0x10^3$	Nil
50% WF	10g	$4.0x10^3$	$7.0x10^3$	Nil	Nil	$2.0x10^3$	Nil
30% SF:	5g	$6.0x10^3$	$2.5x10^3$	$3.1x10^3$	$2.0x10^3$	$8.0x10^3$	Nil
70% WF	10g	$5.0x10^3$	$2.0x10^3$	$1.2x10^3$	$1.4x10^3$	$6.0x10^3$	Nil

Table 3 : Microbial Preparation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spiced with Curry (*Murraya koenigii*) after 3 Weeks after production.

Sorghum Flour: Wheat Flour	Spice	A	B	C	D	E	F
100% SF:	5g	$2.5x10^3$	Nil	$5.0x10^3$	$2.6x10^3$	$1.4x10^3$	Nil
0% WF	10g	$1.6x10^3$	Nil	$1.1x10^3$	$2.2x10^3$	$7.0x10^3$	Nil
70% SF:	5g	$2.4x10^3$	$1.5x10^3$	$1.5x10^3$	Nil	Nil	Nil
30% WF	10g	$4.6x10^3$	$7.0x10^3$	$7.0x10^3$	Nil	Nil	Nil
50% SF:	5g	$1.9x10^3$	$2.1x10^3$	Nil	Nil	$6.0x10^3$	Nil
50% WF	10g	$9.2x10^3$	$1.5x10^3$	Nil	Nil	$4.0x10^3$	Nil
30% SF:	5g	$1.2x10^3$	$7.6x10^3$	$6.3x10^3$	$4.0x10^3$	$1.6x10^3$	Nil
70% WF	10g	$1.0x10^3$	$3.3x10^3$	$2.4x10^3$	$2.8x10^3$	$1.2x10^3$	Nil

Table 4 : Microbial Preparation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spiced with Curry (*Murraya koenigii*) After 5 Weeks production.

Sorghum Flour: Wheat Flour	Spice	A	B	C	D	E	F
100% SF:	5g	$3.6x10^4$	$9.0x10^3$	$7.0x10^3$	$2.96x10^4$	$3.96x10^4$	Nil
0% WF	10g	$3.6x10^3$	$1.0x10^3$	$2.2x10^3$	$3.2x10^3$	$1.3x10^3$	Nil
70% SF:	5g	$2.48x10^4$	$2.15x10^4$	$2.08x10^4$	$4.0x10^3$	Nil	Nil
30% WF	10g	$2.0x10^3$	$1.5x10^3$	$9.6x10^3$	$1.0x10^3$	Nil	Nil
50% SF:	5g	$5.96x10^4$	$4.3x10^3$	Nil	Nil	$1.5x10^3$	Nil
50% WF	10g	$2.74x10^4$	$1.8x10^3$	Nil	Nil	$9.0x10^3$	Nil
30% SF:	5g	$1.57x10^4$	$1.0x10^3$	$9.7x10^3$	$5.0x10^3$	$4.2x10^3$	Nil
70% WF	10g	$1.08x10^4$	$5.6x10^3$	$5.4x10^3$	$3.6x10^3$	$3.6x10^3$	Nil

A: Total viable count on Nutrient Agar (N.A)

B: Total *Staphylococcus* count on Manitol Salt Agar (M.S.A)

C: Total Bacillus count on Tryptone Soy Agar (T.S.A)

D: Total haemolytic bacteria count on Blood Agar (B.A)

E: Total fungi count on Malt Extract Agar (M.E.A)

F: Total coliform count on Eosine Methylene Blue (E.M.B)

Table 5 : Sensory Evaluation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spice with Curry (*Murraya koenigii*) immediately after production.

Sorghum Flour/Wheat Flour	Taste	Colour	Cripiness	Odour	General Acceptability
100:0%	b 3.8 ± 0.45 b 3.6 ± 0.90	ab 4.2 ± 0.84 ab 4 ± 0.71	cd 24.2 ± 0.84 cd 2 ± 0.71	bc 3.4 ± 0.89 c 2.8 ± 1.5	ab 4.2 ± 0.45 c 3.6 ± 1.14
70:30%	a 4.6 ± 0.55 ab 4.4 ± 0.89	ab 4.2 ± 0.84 ab 4.4 ± 0.55	bc 3.4 ± 1.34 a 4.8 ± 0.45	c 2.6 ± 1.1 c 2.8 ± 0.84	bc 3.4 ± 1.14 b 3.6 ± 1.15
50:50%	bc 3.4 ± 0.90 b 3.6 ± 0.90	bc 3.4 ± 1.14 bc 3 ± 0.71	c 2.6 ± 1.5 cd 2.2 ± 1.3	b 3.8 ± 0.84 bc 3 ± 1.41	b 3.8 ± 0.84 4.4 ± 0.55
30:70%	b 3.8 ± 0.84	bc 3.4 ± 0.89	c 1.4 ± 0.89	bc 3 ± 1	b 3.8 ± 0.84

	ab 4 ± 0.71	b 3.6 ± 1.14	2.6 ± 1.14	c 2.6 ± 0.55	b 3.8 ± 1.1
0:100%	b 3.8 ± 0.84	b 3.8 ± 1.1	d 1.8 ± 0.84	bc 3.2 ± 0.84	bc 3.4 ± 0.89
	b 3.8 ± 0.84	c 2.8 ± 0.45	d 1.6 ± 0.55	bc 3.4 ± 0.55	bc 3.2 ± 0.89

Table 6 : Sensory Evaluation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spice with Curry (*Murraya koenigii*) three weeks after production.

Sorghum Flour/Wheat Flour	Taste	Colour	Cripiness	Odour	General Acceptability
100:0%	b 3.8 ± 0.45	ab 4.2 ± 0.84	bc 3.4 ± 0.89	c 2.2 ± 0.83	ab 4.2 ± 0.44
	b 3.6 ± 0.90	ab 4.0 ± 0.70	c 2.8 ± 1.49	cd 2.0 ± 0.70	ab 4.4 ± 0.54
70:30%	a 4.6 ± 0.55	ab 4.2 ± 0.83	c 2.6 ± 1.14	bc 3.4 ± 1.34	bc 3.4 ± 1.14
	ab 4.4 ± 0.90	ab 4.4 ± 0.54	c 2.8 ± 0.83	a 4.8 ± 0.44	bc 3.0 ± 0.73
50:50%	bc 3.4 ± 0.90	bc 3.4 ± 1.14	b 3.8 ± 0.83	b 3.6 ± 1.51	bc 3.4 ± 1.54
	b 3.6 ± 0.90	bc 3 ± 0.70	bc 3.0 ± 1.41	cd 2.2 ± 1.30	cd 2.4 ± 1.14
30:70%	b 3.8 ± 0.84	bc 3.4 ± 0.89	bc 3 ± 1	c 1.4 ± 0.89	c 2.6 ± 0.54
	ab 4 ± 0.71	b 3.6 ± 1.14	c 2.6 ± 0.54	c 2.6 ± 1.14	bc 3.2 ± 0.83
0:100%	b 3.8 ± 0.84	b 3.8 ± 1.09	bc 3.2 ± 0.83	d 1.8 ± 0.83	d 1.8 ± 0.83
	b 3.8 ± 0.84	c 2.8 ± 0.44	bc 3.4 ± 0.54	d 1.6 ± 0.54	bc 1.8 ± 0.83

Table 7 : Sensory Evaluation of Biscuit Produced from the Blends of Sorghum Flour and Wheat Flour Spice with Curry (*Murraya koenigii*) six weeks after production.

Sorghum Flour/Wheat Flour	Taste	Colour	Cripiness	Odour	General Acceptability
100:0%	d 1.8 ± 0.83	3.6 ± 0.54	cd 2.4 ± 0.54	cd 2 ± 1	cd 2 ± 1
	d 1.8 ± 0.83	bc 3 ± 0.70	bc 3 ± 1	c 2.6 ± 1.40	cd 2.4 ± 1.34
70:30%	bc 3.2 ± 0.83	c 2.8 ± 0.83	bc 3.2 ± 0.83	cd 2.4 ± 1.14	bc 3.2 ± 1.09
	bc 3.4 ± 0.89	bc 3.2 ± 0.83	cd 2.4 ± 0.54	bc 3.4 ± 0.89	3 ± 1.22
50:50%	c 2.8 ± 0.83	b 3.8 ± 0.44	b 3.8 ± 0.44	c 2.6 ± 0.54	bc 3 ± 0
	cd 2.4 ± 0.89	c 2.8 ± 0.83	cd 2 ± 0.70	c 2.8 ± 1.09	c 2.2 ± 1.30
30:70%	b 3.6 ± 0.89	bc 3.4 ± 0.89	c 2.6 ± 1.14	bc 3 ± 1	c 2.8 ± 1.09
	b 3 ± 0.70	cd 2.4 ± 0.54	c 2.8 ± 0.44	c 2.8 ± 0.83	2.6 ± 0.54
0:100%	bc 3.2 ± 0.83	bc 3.2 ± 0.44	cd 2.4 ± 0.89	cd 2.4 ± 1.40	cd 2 ± 1.22
	bc 3 ± 1.22	bc 3 ± 0.70	cd 2 ± 1	c 2.6 ± 1.14	c 2.8 ± 0.83

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Assessment of Epiphyte Diversity in Avenue Trees of National and State Highways of Udupi District, India

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Abstract -The epiphytic diversity on avenue trees was assessed in a national highway and two state highways of Udupi district, Karnataka. The study showed that diversity of woody substratum comparatively similar in two state highways and national highway, but recorded high abundance of fast growing, exotic tree varieties in national highways compared to state highways. There is no significant difference between Shannon's diversity and Pielou's evenness values between national highway (2.183, 0.878) and state highways (2.304, 0.927). The abundant encountered species are belongs to family Orchidaceae. The native trees with larger girth hold and support more epiphyte species in both national and state highways.

Keywords : *Epiphyte, Highways, Diversity.*

GJSFR-C Classification: *FOR Code: 100107p , 070507*

Strictly as per the compliance and regulations of :

Assessment of Epiphyte Diversity in Avenue Trees of National and State Highways of Udupi District, India

Poornima Jyothi D'cunha [α], P. Venkatramana Gowda [σ] & Rajeshwari.H.S [ρ]

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I. Introduction

The diversity of epiphytic flora may provide an indication of ecosystem health as they are considered as an important component of plant life which constitutes about 10% of flora present worldwide. The epiphytic diversity and its abundance is depends on the forest structure, tree species composition and atmospheric humidity. Tree species composition affects epiphytic vegetation through substratum characteristics provided by each tree species, giving rise to host-epiphyte specificity (Went, 1940). The vertical distribution of epiphytes is mostly determined by patterns in photon flux density (PFD) and humidity in subsequent forest strata. The specific humidity level is also an important factor for diversity and composition of epiphyte (Sanford 1968). The presence of individual species, including crustose lichens and bryophytes, in seven habitats representing different canopy positions, based on a sample of twenty trees in an old conifer forest. Many authors have contrasted epiphytes on various species of trees. The studies demonstrated some important patterns of variation in epiphytes. These are 1) quantification of the relative strength of these various patterns, 2) consideration of dead trees as habitat for epiphytes, and 3) synthesis and reconciliation of seemingly disparate results from various regions (Pike *et al.*, 1975).

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The epiphytes are important with relation to the biological diversity maintaining a balance in nature. Due to manual activities, pollution is on all the time rises and therefore epiphytes are declining in number. Due to the shrinkage of forest areas and need for timber and firewood, the avenue trees are also being destroyed day by day, cheating epiphytes of their natural habitat.

Objective of the study:

1. Study of nature of the epiphytes.
2. Study of occurrence of the epiphytes.
3. Study of abundance of epiphytes.

II. Review of Literature

Schimper (1888) studied the taxonomic diversity of epiphytes and listed 33 families and 232 genera of epiphytes.

Went, 1940 documented different epiphyte vegetations found in different lowland rain forests. This is related to forest structure, tree species composition and atmospheric humidity. Tree species composition affects epiphytic vegetation through substratum characteristics provided by each tree species, giving rise to host-epiphyte specificity. Distibution of hemiparasites and hemiepiphytes can vary in at least two ways: horizontally, they can differentiate between host species and forest types, and vertically, they vary from the tree base to its top.

The following substratum factors are relevant, like texture (roughness) and porosity of bark (water interception and storage) pH and nutrient contents of bark; cover and characteristics of litter and bryophyte mats; bark toxins; bark turn-over rate etc. The vertical distribution of epiphytes is mostly determined by patterns in photon flux density (PFD) and humidity in subsequent forest strata. For instance, many epiphytic Bromeliaceae members show specific humidity demands. (Sanford 1968).

Pike *et al.*, (1975), Studied the presence of individual species, including crustose lichens and bryophytes, in seven habitats representing different canopy positions, based on a sample of twenty trees in an old conifer forest. Many authors have contrasted epiphytes on various species of trees. The studies demonstrated some important patterns of variation in

epiphytes. These are 1) quantification of the relative strength of these various patterns, 2) consideration of dead trees as habitat for epiphytes, and 3) synthesis and reconciliation of seemingly disparate results from various regions.

High canopy dwellers must be able to withstand frequent periodic droughts. All orchid species among them are small-sized and succulent, and some of them have terete leaves. The water-absorbing capacity of the trichomes of *Tillandsia* has been demonstrated by Benzing, 1776.

Relatively a few lineages have been able to enter the epiphytic niche, presumably because of the complex suite of adaptations needed. Thus even though it is true that the evolution of an epiphytic habit has been a relatively common feature of vascular plant evolution, it is equally true that very few of the taxa that have evolved an epiphytic habit have radiated successfully to produce other epiphytic species. In most of the epiphyte-containing families, epiphytism is a rather insignificant anomaly. Indeed, eliminating a mere 85 such "oddball" species from the roster of the world's epiphytes removes 3 1 families from the epiphytic ranks. Only 32 seed plant families have as many as five or more epiphytic species, 26 of these with epiphytes in the Neotropics. It is on the 42 families that contain epiphytes in the Neotropics. Even though this analysis of epiphyte diversity and distribution is largely focused on the Neotropics, a few comparisons with the Paleotropics are instructive. There are actually slightly more families with epiphytes in the Paleotropics (43) than in the Neotropics (42), with all of the paleotropical epiphytic families having epiphytic representatives in Australia but only 15 in Africa and Madagascar. If only the 32 seed plant families with five or more epiphytic species are considered, there are also roughly equal representations of epiphyte-containing families in the Neotropics (26) and Australia (25), but only about half as many in Africa (14). At the species level the story is very different. There are many more epiphytes in the Neotropics, at least half again as many as in Australasia and six times as many as in Africa. Although similar numbers of genera and families evolved epiphytism in the different regions, subsequent speciation as epiphytes was dramatically greater in the Neotropics. (Burger, 1977)

The diversity in epiphyte communities might be maintained by disturbance in forest canopies, bark exfoliation, detaching branches and new growth that prevents competitive exclusion within the community. (Benzing ,1981).

Differences in the distributions of Tillandsias and orchids may not reflect past competition as much as phylogenetic differences in mechanisms of seed dispersal and seedling establishment (Chesson and Warner, 1981).

Plant families belonging to different habit groups have fundamentally different distributional patterns. Families composed mostly of canopy trees or lianas have their greatest diversity in Amazonia whereas families made up mostly of epiphytes, shrubs, or palmetto-type herbs are largely extra- Amazonian and are especially concentrated along the lower slopes of the northern Andes and to a lesser extent in southern Central America. For epiphytes, this concentration of species diversity could have been predicted from the trends outlined above.(Gentry, 1982).

The open forests are generally short in stature and possess a limited number of potential epiphytic host species (phorophytes). A dominant tree in areas of these forests is the logwood, *Haemotoxylon campechianum*, a species of tree utilized in olden times to produce fabric dyes. (Dachary & Arnaiz,1983).

A hemiepiphyte, apparently needs the accumulations of organic debris to germinate and establish. It starts its luxuriant growth through the forest from the lower canopy. As indicated above, "moss epiphytes" are found mainly on large more or less horizontally positioned branches. Apart from the species mentioned before, *Maxillaria superf, Dichaea picta*, and *Xiphopteris nana* prefer the lower canopy.(Kelly, 1985).

Forest associations dominated by *H. campechianum* are referred to as tintales. Vascular epiphytes in tintales are abundant and the epiphyte community is relatively diverse. There recorded 183 individuals representing 17 species of vascular epiphytes in an 800 m^2 sample of tintal in the Sian Ka'an Biosphere Reserve in the state of Quintana Roo, Mexico. The abundance of epiphytes in these forests may be due to high humidity maintained by standing water which can persist in the dry season.(Olmsted and Durang, 1986).

The long and fine roots of orchids and tillandsioids also seem adaptive to this special habitat, since they may curl around the smallest twigs and provide solid attachment. (Chase 1987).

Tree tops represent a tiny proportion of the total habitat in the forest. Some species were most frequent on dead tree tops while others were more abundant in the living tops. We hypothesize that treetops develop a distinctive epiphyte community because they are so frequently visited by birds and others. Birds influence epiphyte communities by bringing propagules on their feet and increasing local nutrient availability through deposition of feces. (Kantvilas and Minchin,1989).

Ryan, (1991) studied in detail the factors responsible for the pronounced differences in epiphytes between the upper and lower sides of leaning trunks.

Light is rapidly attenuated between 13 and 37 m high in the canopy, the "light transition zone." Biomass of epiphytic macrolichens at the crane site is about 1.3 metric tonsha, composed of approximately 42%

cyanolichens, 28% alectorioid lichens, and 30% other lichens (McCune *et al*., 1993).

In western British Columbia, found that the lean of trunks influences epiphytes mainly through the interception of precipitation, as opposed to differential stem flow or light. This contrasting environment produces the well-known contrast in lichen communities: the sheltered side with a thin community rich in *Caliciales* and *leprose* lichens, with the upper side often heavy with macroepiphytes. At our study site, *Chaenotheca brunneola* and *Lepraria spp*. had the strongest association with the lower sheltered side, with a similar but weaker tendency shown by *Hypocenomyce friesii* and *Lopadium discifone*. Many other species occur in this habitat but were too infrequent to demonstrate their association statistically. Associated with the upper side of leaning trunks were *Cladonia squamosa* var. *subsquamosa, C. transcendens*, *Ochrolechia oregonensis, Cephalozia lunulifolia, Dicranum fuscescens,* and *Scapania bolanderi*. More species of epiphytes showed a distinct association with the very tops of trees (within two m of the top) than any other single habitat in the forest.(Sillett and Rambo, 2000).

III. Material and Methods

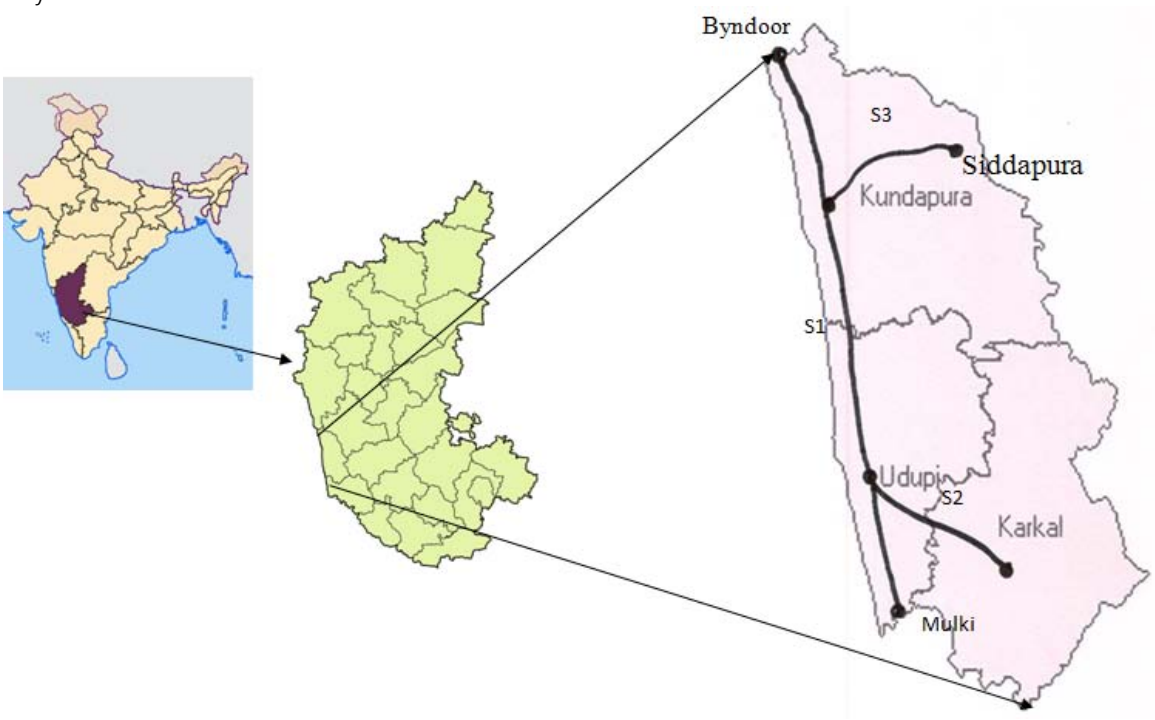
Study area: The present study is carried out in one national highway (NH) and two state highways (SH), 13°06' 20.86''N to 13 ° 12.52''N and 74° 47' 13.12'' to 74° 37' 43.31''E. 50x20 m Belt transacts was used for the epiphytic sampling. Transacts were laid randomly just next to the footpath on either sides. 90 and 60 transacts were laid in NH and SH respectively. Girth at breast height (GBH) ≥ 30cm and the height of all trees in transact was recorded. Their occurrence and height were noted. The epiphytes present in transacts were identified using standard key books. Dried specimens are then mounted on herbarium sheets of standard size 29x42 cm using synthetic glue and the woody part of the specimen is stitched using white coloured thread. The specimens like patches of mosses and the orchids are preserved using the 70% alcohol.

Shannon-Wiener's diversity was used to calculate the variation in phytoplankton species diversity of the study area along the national and state highways using the formula

$$H' = {}^{s}\sum_{i} Pi \log_e (Pi)$$

Where *s is* the number of species, and P*i* is the proportion of the total number of individuals consisting of the i^{th} species.

The study area:



The study area was represented as follows.

Table 1 : Study area

Study area		Site no.
National Highway(NH)	Mulki to Byndoor	S1
State Highway (SH)	Udupi to Karkala	S2
State Highway (SH)	Kundapura to Siddapura	S3

IV. Results and Discussion

The avenue trees found on the study area are represented in the table.

Table 2 : Avenue trees found on the study area.

Botanical name of the avenue tree	S1	S2	S3
Acacia auriculiformis	+	+	+
Acacia sinuate	+	+	+
Albizia lebbeck	+	+	+
Alstonia scholaris	+	+	+
Artocarpus heterophyllus	+	+	+
Artocarpus hirsutus	+	+	+
Borassus flabellifer	-	+	+
Casuarina equisetifolia	+	+	+
Calophyllum inophyllum	-	+	+
Caryota urens	-	+	+
Dalbergia sissoides	-	+	+
Erythrina variegata	+	+	+
Eucalyptus tereticornis	+	+	+
Ficus benghalensis	+	+	+
Ficus religiosa	+	+	+
Hopea parviflora	+	+	+
Hopea ponga	-	+	+
Mammea suriga	-	+	+
Mangifera indica	+	+	+
Mimusops elengi	+	+	+
Morinda citrifolia	-	+	+
Olea dioica	-	-	+
Pongamia pinnata	-	+	+
Pterocarpus marsupium	-	+	+
Samanea saman	+	+	+
Syzygium cumini	-	+	+
Tectona grandis	-	+	+
Vatica chinensis	-	+	+
Vateria indica	+	+	+

The above table reveals more avenue trees are in state highways than national Highway 17.

The epiphytes present on the avenue trees are represented in the table.

Table 3 : The epiphytes present on the avenue trees of study area.

S. No.	Name of the plant	Type of the plant	Family
1	*Calymperes tenerum* C. Muell.	Bryophyte	Calymperaceae
2	*Sematophyllum caespitosum*(Hedw.)Mitt.	Bryophyte	Sematophyllaceae
3	*Taxithelium nepalense*(Schwaerg.) Broth.	Bryophyte	Sematophyllaceae
4	*Drynaria quercifolia* (L.)J.Sm.	Pteridophyte	Polypodiaceae
5	*Acampe praemosa*(Roxb.) Blatt. & McCann.	An orchid	Orchidaceae
6	*Bulbophyllum neilgherrense* Wight.	An orchid	Orchidaceae
7	*Cleisostoma tenuifolium* (L.) Garay	An orchid	Orchidaceae
8	*Dendrobium ovatum*(Willd.)	An orchid	Orchidaceae
9	*Rhynchostylis retusa* Blume	An orchid	Orchidaceae
10	*Vanda testacea*(Lindl.)Reichb.	An orchid	Orchidaceae

From the current study it is observed that *Acacia auriculiformis, Artocarpus heterophyllus, Casuarina equisetifolia, Eucalyptus tereticornis, Samanea saman, Mangifera indica,* and *Tectona grandis* are more common. The epiphytes and the parasites are absent on *Acacia auriculiformis, Casuarina equisetifolia, Eucalyptus tereticornis* and *Vateria indica*. The epiphytes are commonly found on *Artocarpus heterophyllus, Artocarpus hirsutus, Dalbergia sissoides, Ficus religiosa, Ficus benghalensis, Mammea suriga, Mangifera indica, Pongamia pinnata, Samanea saman*.

The epiphytes which are common in the Udupi district are *Calymperes tenerum, Sematophyllum caespitosum, Taxithelium nepalense, Drynaria quercifolia, Acampe praemosa, Bulbophyllum neilgherrence, Cleisostoma tenuifolium, Dendrobium ovatum, Rhynchostylis retusa, Vanda testacea*. Shannon's diversity index of epiphytic species was higher in SH (0.907) compared to NH (0.846).

The distribution of epiphytes in National and state highways are represented below.

Table 4 : The distribution of epiphytes in National and state highways.

Avenue tree species	*Cal*	*Sem*	*Tax*	*Dry*	*Aca*	*Bul*	*Cle*	*Den*	*Rhy*	*Van*
Acacia auriculiformis	-	-	-	-	-	-	-	-	-	-
Acacia sinuate	-	-	-	-	-	-	-	-	-	-
Albizia lebbeck	+	+	+	+	-	-	-	-	-	-
Alstonia scholaris	-	-	-	-	-	-	-	-	-	-
Artocarpus heterophyllus	+	+	+	+	+	+	+	+	+	+
Artocarpus hirsutus	+	+	+	+	+	+	+	+	+	+
Borassus flabellifer	+	+	+	+	-	-	-	-	-	-
Calophyllum inophyllum	-	-	-	-	-	-	-	-	-	-
Caryota urens	-	-	-	+	-	-	-	-	-	-
Casuarina equisetifolia	-	-	-	-	-	-	-	-	-	-
Dalbergia sissoides	+	+	+	+	+	-	-	-	-	+
Erythrina variegata	+	+	+	+	+	-	-	-	-	-
Eucalyptus tereticornis	-	-	-	-	-	-	-	-	-	-
Ficus benghalensis	+	+	+	+	+	-	-	-	-	+
Ficus religiosa	+	+	+	+	+	-	-	-	-	+
Hopea parviflora	+	-	+	-	-	-	-	-	-	-
Hopea ponga	+	+	+	-	+	+	-	-	-	-
Mammea suriga	+	+	+	+	+	+	+	+	+	+
Mangifera indica	+	+	+	+	+	+	+	+	+	+
Mimusops elengi	+	+	+	+	+	-	-	-	-	-
Morinda citrifolia	-	-	-	-	-	-	-	-	-	-
Olea dioica	+	+	+	+	+	+	-	-	-	-
Pongamia pinnata	+	+	+	+	+	+	+	+	+	+
Pterocarpus marsupium	+	+	+	+	+	-	-	-	-	-
Samanea saman	+	+	+	+	+	-	-	-	-	-
Syzygium cumini	+	+	+	+	+	-	-	-	-	-
Tectona grandis	-	-	-	+	-	-	-	-	-	-
Vateria indica	-	-	-	-	-	-	-	-	-	-
Vatica chinensis	-	-	-	-	-	-	-	-	-	-

Herbaceous vascular epiphyte species numbers are less and within the range of six in study area. Since the study area receives only moderate to heavy rainfall with a dry period of 4–5 months, epiphyte diversity is less.Epiphytes mostly occurred on trees located along the state highways S2 and S3 (figure 1), than the national highway S1 (figure2). Moisture seems to be the most important ecoclimatic variable (Benzing 1981) mainly to the cryptogamic types i.e. three genera from bryophytes, one genus from pteridophyta and six genera from angiosperms belonging to family Orchidaceae are epiphytes.

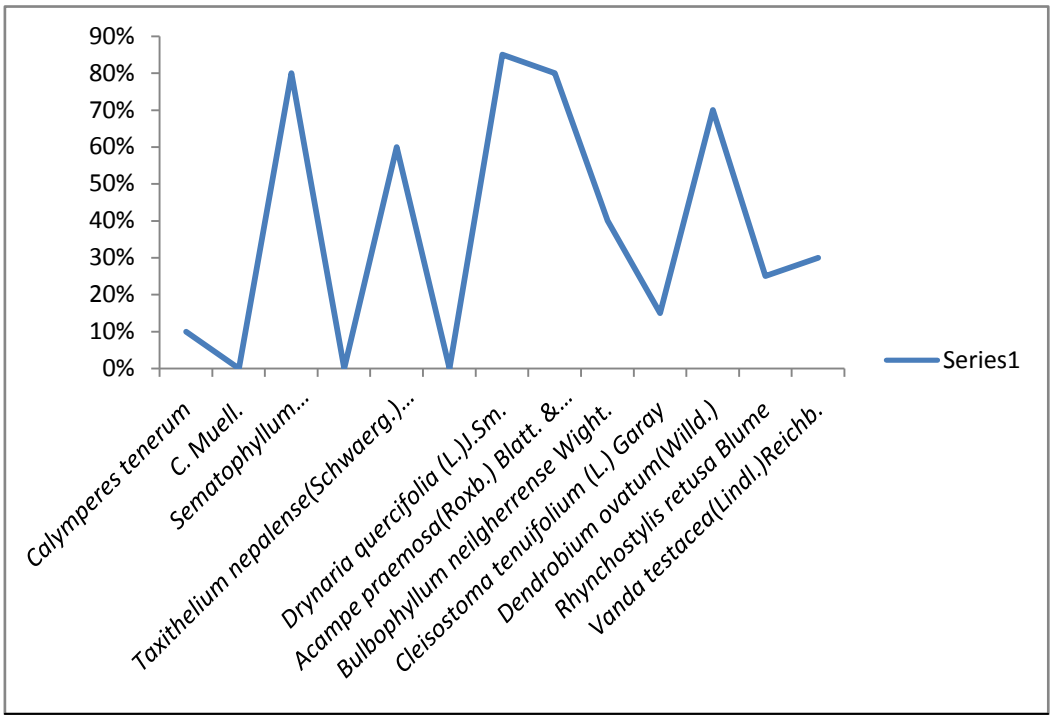


Figure 1 : Distribution of epiphytes along the study area S2 and S3

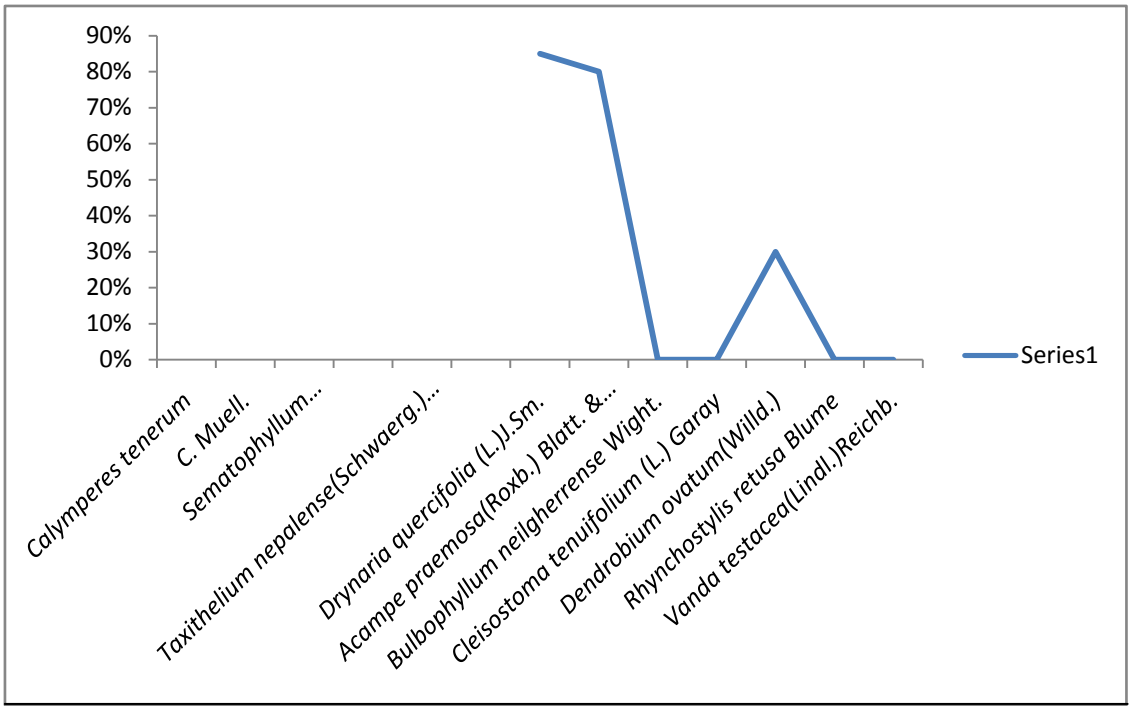


Figure 2 : Distribution of epiphytes along the study area S1

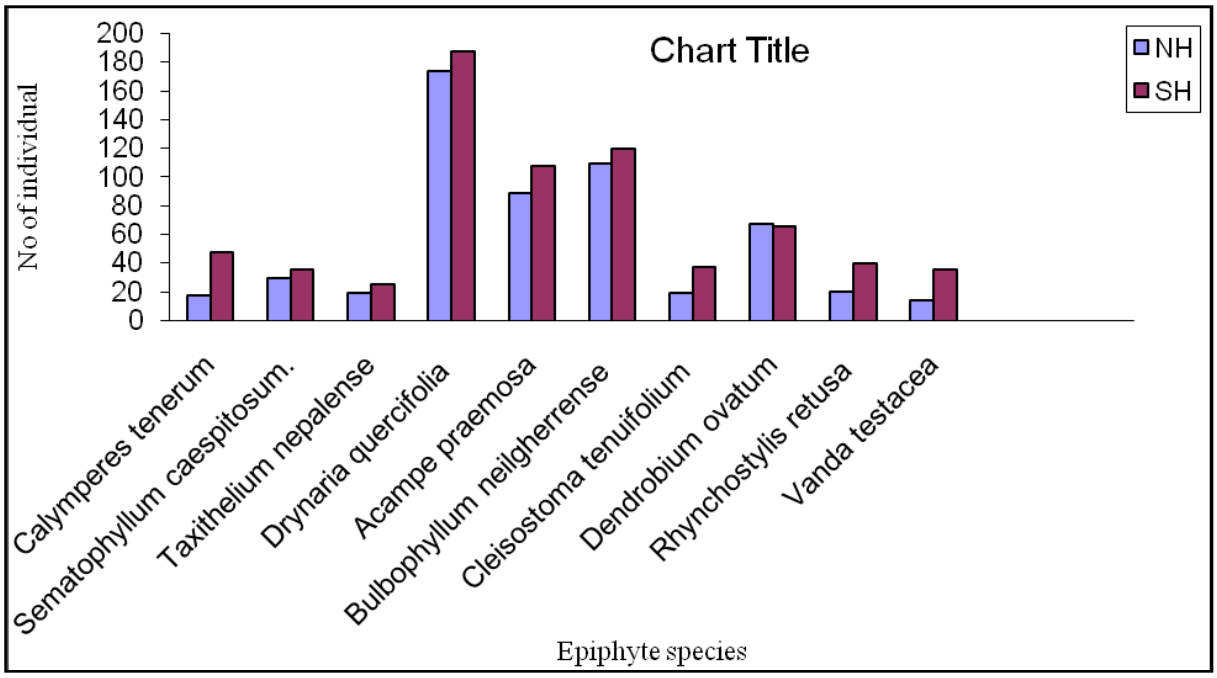


Figure 3 : Distribution of epiphytes along the study area S1, S2 and S3

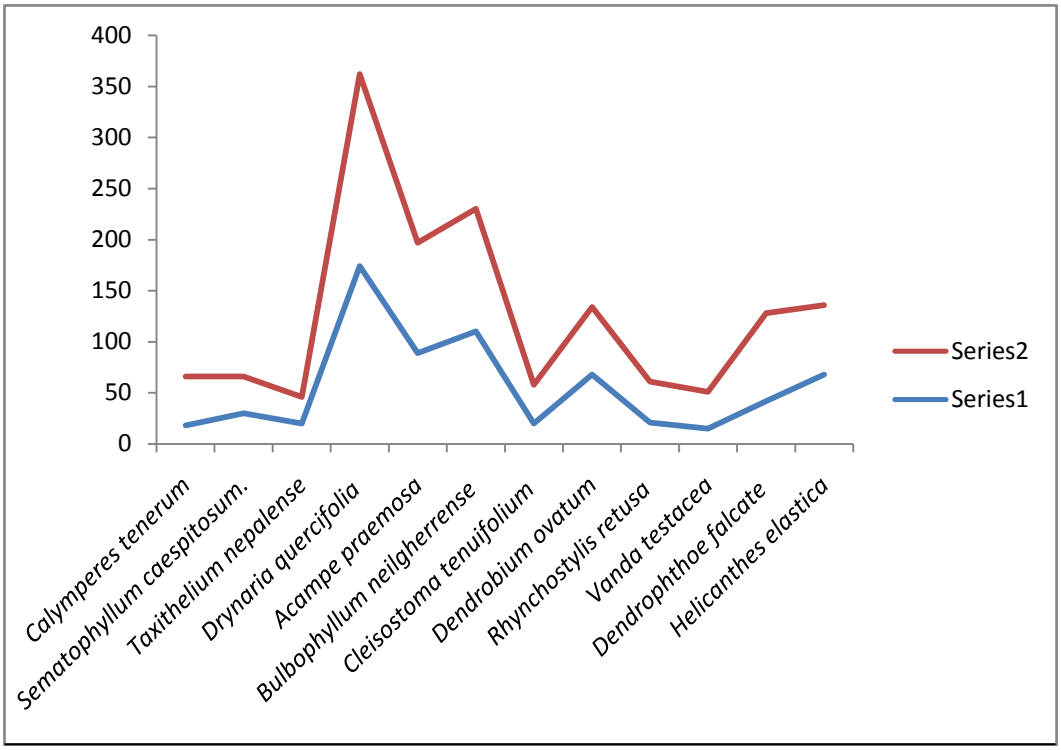


Figure 4 : Distribution of epiphytes along the study area S1, S2 and S3.

According to Went (1940), the different epiphyte vegetations may be found in different lowland rain forest types. This is related to forest structure, tree species composition, and atmospheric humidity. Tree species composition affects epiphytic vegetation through substratum characteristics provided by each tree species, giving rise to host-epiphyte specificity. But in Udupi district the epiphytes which are present on the avenue trees do not show host specificity but it has been observed that in *Mangifera indica* and *Samanea saman* supports more number of epiphytes because in these plants the presence of very thick bark helps in the accumulation of moisture and organic matter. Limited epiphytes were observed on the plants like *Dalbergia*

sissoides, Elaeocarpus tuberculatus, Mammea suriga and *Pongamia pinnata*. Because of the thin bark which is unable to support organic matter and moisture. The epiphytes were totally absent in *Acacia auriculiformis, Casuarina equisetifolia, Eucalyptus tereticornis* and *Vateria indica* because of peeling of bark reduces the moisture and organic matter to almost nil (table no.4).

According to Benzing (1776), the high canopy dwellers must be able to withstand frequent periodic droughts. All the orchid species among them are small-sized and succulent and some of them have terete leaves. The water-absorbing capacity of the trichomes of *Tillandsia* has been demonstrated. During the current study it has been also observed in Udupi district. The epiphytes mainly the orchids show various modifications like the presence of thick elongated roots along with the velamen tissue, presence of pseudobulbils, and thick succulent leaves which helps the plants to absorb moisture from the environment and conserve water. In *Drynaria quercifolia* the presence of pocket leaves is an additional feature which helps in the collection of organic matter.

According to Sanford (1968), distibution of hemiparasites and hemiepiphytes can vary in at least two ways: horizontally, they can differentiate between host species and forest types, and vertically, they vary from the tree base to its top. The following substratum factors are relevant: texture (roughness) and porosity of bark (water interception and storage, grip for diaspores); pH and nutrient contents of bark, cover and characteristics of litter and bryophyte mats, bark toxins and bark turn-over rate. The vertical distribution of epiphytes is mostly determined by patterns in photon flux density (PFD) and humidity in subsequent forest strata. For instance, many epiphytic Bromeliaceae members show specific humidity demands. In Udupi district distribution of the epiphytes and parasites varies in the given study area. On the national highways thenumber of epiphytes are less compared to the state highways and the moss mats are common on the state highways on the avenue trees. On the national highway, N.H.17 *Acacia auriculiformis, Artocarpus heterophyllus, Casuarina equisetifolia, Eucalyptus tereticornis, Samanea saman, Mangifera indica,* and *Tectona grandis* are more common. The epiphytes are commonly found on *Artocarpus heterophyllus, Artocarpus hirsutus, Ficus religiosa, Ficus benghalensis, Mangifera indica,* and *Samanea saman*. The epiphytes are absent on *Acacia auriculiformis, Casuarina equisetifolia, Eucalyptus tereticornis* and *Vateria indica*, where the bark is thin or absent because of peeling. On the state highway *Samanea saman, Artocarpus heterophyllus, Tectona grandis* and *Mangifera indica* are more common. The epiphytes are commonly found on *Artocarpus heterophyllus, Artocarpus hirsutus, Dalbergia sissoides, Elaeocarpus tuberculatus, Ficus religiosa, Ficus benghalensis, Mammea suriga, Mangifera indica, Pongamia pinnata, Samanea saman* and *Tectona grandis*. On the state highway, the most of the trees have a thick bark. This stores water and organic matter. The national highway N.H.17 is proximity to the Arabian Sea there by increasing the humidity but rain fall is comparatively less because of deforestration. In the areas of state highway there are wild life conservation parks like Kudremukh national park nearer to Udupi to Karkala state highway and Mookambika reserve forest in Kundapura to Siddapura state highway which have rich vegetation, thereby increasing the moisture and organic matter. Hence epiphytes are more common in state highways. In the present study, it is observed that *Drynaria quercifolia* is more common and present on most of the avenue trees of study area. The present study also indicates that *Acampe praemosa* was more commonly present on *Mangifera indica*. The rest of the orchids present on most of the avenue trees.

Among the mosses *Sematophyllum caespitosum* was more common. The three types of the mosses (*Calymperes tenerum, Sematophyllum caespitosum, Taxithelium nepalense*) were more commonly present on *Mangifera indica* and *Samanea saman*.

Epiphytes grow very well on old avenue trees. In most of the young trees the epiphytes were absent. As the plant becomes older the number of epiphytes and parasites increases. In young trees only one type of moss was found where as in old trees all the three types of mosses were found. When the tree grows older, woody the variety of epiphytes and parasites go on increasing.

V. Summary and Conclusion

In the present study, it is observed that the epiphytes are commonly found on *Acacia auriculiformis, Artocarpus heterophyllus, Casuarina equisetifolia, Eucalyptus tereticornis, Samanea saman, Mangifera indica,* and *Tectona grandis* are more common. The epiphytes and the parasites are absent on *Acacia auriculiformis, Casuarina equisetifolia, Eucalyptus tereticornis* and *Vateria indica*. The epiphytes are commonly found on *Artocarpus heterophyllus, Artocarpus hirsutus, Dalbergia sissoides, Elaeocarpus tuberculatus, Ficus religiosa, Ficus benghalensis, Mammea suriga, Mangifera indica, Pongamia pinnata, Samanea saman* and *Tectona grandis*. In most of the trees, mosses and *Dynaria quercifolia* are more common and occur in large quantities. The epiphytes which are common in Udupi district are *Drynaria quercifolia, Calymperes tenerum, Sematophyllum caespitosum, Taxithelium nepalense, Acampe praemosa, Bulbophyllum neilgherrence, Cleisostoma tenuifolium, Dendrobium ovatum, Rhynchostylis retusa, Vanda testacea,*

On the national highway due to dust, pollution, heavy traffic and lesser rain fall, the epiphytes were

fewer in number and variety. Many were found on older trees having thicker bark and hence had more organic material and moisture. Younger trees do not support much epiphytes growth.

On the state highway, owing to less traffic and heavier rain fall, the varieties of epiphytes were much greater than on the National Highways.

In the study areas the National Highway, (S1) lot of trees being cut for the purpose of broadening of the road in order to allow more traffic and also for the use as timber. Because of this, epiphytes have lost their natural habitat and in the process some rare epiphytes belonging to the family Orchidaceae are on the verge of extinction. Afforestration is taking place on a large scale but the trees used for afforestration are *Acacia auriculiformis, Casuarina equisetifolia, Eucalyptus tereticornis, Vateria indica*. These trees are fast growing but have a very thin or no bark due to peeling. Hence they cannot support epiphytes, thus leading to a reduction in their number.

In the study area on the state highways, (Udupi to Karkala and Kundapura to Siddapura) however avenue trees are naturally growing and have epiphyte supporting characteristics and hence here the growth of epiphytes is much more than on the National Highway. But due to lack of awareness the avenue trees are also being cut for house hold uses. Hence trees show the risk factor for the survival of the epiphytes on them.

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Tumbling Behaviour of Pigeons

By Dr. M. Ashraful Kabir
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Abstract - Neck muscles of the rolling pigeons are excited through shaking or auto or continuous excitation. Though the tumbling is backward; the neck muscle is a great factor for this. Flying tumbler pigeon rolls during flying; here flying velocity and height is a fator but parlor tumbler when fly its neck muscles not excited. Lateral shaking is responsible for tumbling not shakes of dorso-ventrally. Normally tumblers are two types that are tumbler and roller. Then tumbler divides house or parlor tumbler and flying tumbler. On the other hand roller or parlor rollers are two types which are autoroller and shaking/non shaking roller. In the tumbler pigeon family there are a lot of flying tumblers (fly at night, great height), tippler (fly 22 hours, first in UK in 1971) by the cross between tumbler and Cumulet (fly 10 hours) from France (sustained flight, rapid tumble, short flying tumbling, auto tumbler), highflier (fly 15 hours, elongated body) but only dasti (common) tumbles till tired, kalami (strike on the beak), havai (short tumble then fly), auto parlor tumblers (like epilepsy disease) excited any internal and external factors which induces chemical reaction for tumbling. Anticonvulsant drugs are effective on pigeons tumbling.

Keywords : *Pigeons, rolling, tumbling, genetics.*

GJSFR-C Classification: *FOR Code: 060801*

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Keywords : *Pigeons, rolling, tumbling, genetics*

I. Introduction

Roller and tumbler pigeons are basically two types. One is flying and other non flying which is roller. Again flying is classified into tumbler and rolling tumbler and then tumbler are three types, Tippler, highflier and house or parlor tumbler. Rollers can be flying and non flying. In case of flying roller there is Birmingham, Oriental and Galati and on the other hand non flying are two types parlor/house/auto and other shaking including dasti, kalami and havai roller pigeon (in India this is called ground tumbler of India) (Levi, 1965). Before 1590 to 1600 AD the spectacular somersault of pigeons first observed by Darwin and finally Levi described it within his books. From the references of David Gibbs there are 316 species of pigeons and doves in the world. From the Mesopotamia (500 BC) the pigeons' history has started and lastly Levi has improved to write. Both parlor and flying tumbler (couple tumble) pigeons' rolling (many flips at one time) behaviour comes from hundreds of thousands or ever millions and uncountable evolution of selective breeding (Darwin, 1897). Wild type which is dominant on non tumbling variety that's why when it crossed with tumbler pigeon the offspring are non tumbler.Under domestication from the wild rock to create varieties by Darwin in his writing 'Origin of Species'.The genetic behavior of pigeons was mentioned by Gilbert 1947. Abnormal phenomena of neurone and cerebellum of the brain control its movement and balance during rolling. There were some differences between peripheral neurone and skeletal myoblast of this type of pigeon than others (Lange, 1952).

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II. Materials and Methods

Pigeon hole : Two types of experimental cage, one was 25x20x18 (Plate 1) and another 22x18x16 inches (Plate 2). Total numbers of lab pigeons were 9 pairs.

Number of pigeons and types : Moos-sulli (flyingtumbler) (Plate 4) 3 pairs from Khulna, Lowtan (ground tumbler) (Plate 3) 3 pairs from Bogra and Crossed Indigenous (Plate 5) 3 pairs from Jessore, Bangladesh.

Feeding : The standard mixed feed corn-6 kgs, wheat-4 kgs, mustard-0.5 kg, black pea-2.5 kgs, broiler feed-1 kg, Japanese millet-0.5 kg and chick pea-0.5 kg for 15 kgs of food (Plate 6) were provided daily 2 times, morning 8:00 a.m. and evening 5:30 p.m.

Breeding program : All pigeons were in good heated for breeding. For inbreeding depression and sib mating the squab's size is decreasing day by day. The original parent carries heterozygous roller gene +/- and more or less pure line because only in one squab the tails of the tip were black. Rolling practice was started at the age of 30 days of squab. Blindfolding and any barrier are not the reason for non tumbling. The study period was from April 2008 to April 2012.

III. Results

Normally there were not significant differences between shaking tumbler and auto or flying tumbler on its size and weight (Table 1). Tumbling and rolling depends on natural and artificial stimulus. Classification of roll types were huge, great height, slight, single, double and roll down for flying tumbler and for Lowtan huge and primarily one-two-three. Causes of rolling depend on genetics, muscular and stimulants. Peculiarities of this rolling of Lowtan pigeons were sometimes disagree to mate with male or fight to each other. Neck muscles are excited through shaking or auto or continuous excitation of the neck muscles. Flying tumbler pigeon rolls during flying; here initiation of flying is a factor but in shaking tumbler when fly its neck muscles not excited. Lateral shaking is responsible for tumbling not shakes of dorso-ventrally. The tumbling

behaviour depends on maturity of the gene by continuous practice of the squab and within 35-40 days it shows better performance. Though this inherited characteristic but trial and error is must for better performance. During shaking (stimulus) of shaking tumbler, first they harden their neck to back position. An interesting characteristic is that for flying tumbler their eyes are open so that there is no collision in the sky but shaking tumbler their eyes are close so it can get any injury. For human recreation the pigeons are easily collected by rearer and selective breeding are developing day by day which exhibits a lot of genetic variations. By the thought of Lamarck the uses of the organs like neck muscles and tumbling it has gained dominancy for either homozygous (+/+) or herorogyzous (+/-) condition. Parlor and flying tumbler pigeons were from the same family because some flying tumbler tumbles at a very short height or on the hand. The tumbling behaviour depends on maturity of the gene (shows squab) which was on Z chromosome of the male and female and female birds only carry single Z. During tumbling wing and wing muscle is a great factor but not the feet. Same neck muscles of parlor and flying tumbler pigeons some are excited during fly (natural) and some are shaking/not shaking (artificial) or vice versa that is when you raise fly (artificial) and for irregular walking or accident on ground (natural) the tumble will come. Lowtans has less navigation power and it flies horizontally while flying tumbler has the highest navigation power and flies vertically (Wallraff, 2004).

IV. Discussion

Anticonvulsant drugs are effective to stop of pigeons tumbling (Mowrer, 1940). The mode of rolling behavior of pigeons is similar to that of ataxia (Riddle, 1943). Inheritance of this ability was recorded by Darwin 1897. The physiological mechanism of rolling is unknown for its rapid somersaults which cause blur vision Mowrer, 1940. Pigeon fanciers and researchers alike use of somersault per time and duration of the rolls Entrikin and Erway, 1972. By the thought of Lamarck the uses of the organs like neck muscles and tumbling it has gained dominancy for either homozygous (+/+) or herorogyzous (+/-) condition. Tumbler pigeons' muscles are not myotonic and tumbling is unconditioned conditional reflex (Entrikin and Erway, 1972). Measurement of tail, wing, tarsus and beak is not comparable with the wild rock, tumbler and roller pigeon (Ali, 1981). So, it is clearly proved that this rolling or tumbling behaviour is genetical but for this practice is must.

V. Conclusion

The characteristics of pigeons' rolling or tumbling behavior are genetical which comes through millions of thousands selective breeding. First observation of the human and then selective breeding shows this interesting ability. Variation of the rolling or tumbling is drastically happens within it and it is absolutely correct that this phenomena comes from artificial breeding through domestication. Sometimes this pigeon produces non tumbling variety which proves its non tumbling blue wild rock ancestor. The variation of the genes of the non tumbling and tumbling variety need to study to produce more peculiar species and to observe the genetic variation under some circumstances, and where and how this characteristic came which may attract to human and its stability though this is a morbid curiosity of the pigeons.

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Table 1 : Breeding performance of roller and tumbler pigeons

Mating type	No. of pairs	No. of squab	Male: Female	% of Performance	Performers type
Lowtan x Lowtan	3	48	44 : 4	95.83%	Primary rolls 1-3 After maturity rolls huge
Flying Tumbler x Flying Tumbler	3	48	29 : 19	93.75%	4 are excellent performer
Crossed Indigenous x Crossed Indigenous	3	48	24 : 24	0%	Sometimes side rolling

Plate 1

Plate 2

Plate 3

Plate 4

Plate 5

Plate 6

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Leaching Behaviour of Bifenthrin and λ -Cyhalothrin in Sandy Loam Soil

By Reena Chauhan, Indu Chopra & Beena Kumari
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Abstract - The purpose of this study was to determine the leaching behaviour of pyrethroids. Now days pyrethroids are applied largely in India, creating the need to evaluate potential leaching of pyrethroids. Thus leaching of bifenthrin and λ - cyhalothrin in sandy loam soil was evaluated under laboratory conditions with simulated rainfall of 300 mm. Bifenthrin was applied at 2 and 4 µg while λ -cyhalothrin was applied at 2 and 4 µg on soil columns, respectively. Maximum concentration of bifenthrin and λ -cyhalothrin was recovered from 0-5 cm depth in the soils. Results indicated the low mobility of both the insecticides under saturated moisture condition that may be significant in terms of ground water contamination Now a days pyrethroids .

Keywords : *Leaching, bifenthrin, λ-cyhalothrin, residues, sandy loam soil, column.*

GJSFR-C Classification: *FOR Code: 050303, 050399*

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Keywords : Leaching, bifenthrin, λ-cyhalothrin, residues, sandy loam soil, column.

I. Introduction

Pesticides are one of the major technological developments of twentieth century, whether natural or synthetic, they have toxicological significance and pose potential risk when persist in the environment. As they are the most important component of any pest management strategy.The indiscriminate use of pesticides has given rise to many problems viz. persistence of toxic residues in the environment, development of resistance in insect pests and resurgence of pests.Soil, an important component of the environment, act as a sink for the pesticides used in agriculture. Such treatments may suppress soil micro-flora and hence affect soil properties. The pesticides present in soil sometimes act as a source of contamination for succeeding crop also. From soil, the pesticides residues can reach to water bodies by leaching and runoff. The main processes potentially affecting the ultimate fate of pesticides in soil are retention by soil materials (involving adsorption /desorption processes), transformation processes (biological and chemical degradation), and transport (through soil, atmosphere, surface water, or ground water) (Saltzman and Yaron 1986; van der Hoff and van Zoonen 1999).

Bifenthrin,((2-methyl-1,1-biphenyl-3-y1)-methyl-3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclo propanecarboxylate and λ-cyhalothrin, (S)-α-cyano-3-phenoxy benzyl-(Z)-(1R, 3R)-3-(2-chloro-3, 3, 3-trifluoro prop-1-enyl)-2, 2 dimethyl cyclopropane carboxylate, are the member of synthetic pyrethroid family. These groups are characterized by greater photostability and greater insecticidal activity than previous pyrethroids (Morky and Hoagland 1989). Being non-polar in nature their solubility is less in water but have strong tendency to bind to soil (Linde, 1994). It gives rapid knockdown activity to control of a wide spectrum of insects pests like aphids, thrips, lepidopteran larvae, coleopteran larvae and adults in cereals, ornamentals, potatoes, vegetables, cotton and other crops. Despite of their extensive use, very little is known about their leaching behaviour in Indian soil. Since ground water is the main source of drinking and irrigation water thus to assess the risk of ground water contamination by both the insecticides, this experiment was carried out to generate information on the leaching behaviour of both the insecticides in sandy loam soil at different doses under laboratory conditions.

II. Material and Method

a) Chemicals

All the solvents used for this study were of analytical grade. All the solvents were redistilled before use in glass apparatus and their suitability was ensured by running reagent blanks along with actual analysis. The stock solution of both the insecticide prepared at concentration of 1000 μgml^{-1} in GLC-grade analysis; and further diluted to prepare working standards.

b) Sample processing

The leaching experiment was carried out in Residue Laboratory in the Dept. of Entomology CCS Haryana Agricultural University, Hisar. For the experiment, soil was collected from Research Farm of the University and used after drying, grinding and sieving. From the bulk soil samples nine sub-samples of 1.58 kg each were used for filling in plexi glass column (90 cm x 5 cm i.d). Characteristic of soil was as follows:

Commercial bifenthrin and λ-cyhalothrin formulation (2.5EC) was used in leaching experiment. The column was sequentially filled with soil up to the height of 60 cm in triplicate along with blank. Before packing, filter paper was kept at the perforated distal end of the column to allow only the passage of leachate. Filter paper disks were placed on top of the each column to assist uniform dispersion of the water across the column surface. At the bottom of the columns, a funnel with flask was kept to collect the leachate. Before

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the application, both the insecticides were dissolved in deionized water and simultaneously applied to the last 5cm of the soil in the column at the dose of 2 and 4 μg bifenthrin and λ-cyhalothrin (2 and 4 μg). After application of both the insecticides, the columns were irrigated with 98ml of water daily for six days (equivalent to 300mm rain) at the time interval of 24 hrs. After six days, when addition of water was completed, the soil columns were allowed to drain for 36 hrs. Columns were then cut into two equal halves and the soil was sampled in 5cm segments and was used for analysis of residues.

III. Extraction and Clean up

Extraction of both the insecticides from soil was performed as described by Kumari et al. (2008).Water samples (leachates) were extracted by liquid-liquid partitioning with hexane: dichloromethane (85:15 v/v) by adding 5% Sodium chloride solution. Soil samples were air dried and sieved through 2 mm sieve and extracted by using column chromatography. A representative sub-soil of 15 g mixed with 0.3g each of activated charcoal and florisil was filled in a long glass column (60 cm x 22mm i.d.) between two layers of anhydrous sodium sulphate. The residues were eluted with 125 ml of hexane: acetone (9:1v/v). The organic layer was concentrated on rotary vacuum evaporator and final volume was made to 2ml in n- hexane.

The residues of both the insecticides were quantified on Shimadzu 2010 gas chromatograph (GC) equipped with fused capillary column, SPB-5 of 30m × 0.32 mm i.d, 0.25 μm film thickness of polysiloxane (5% diphenyl /95% dimethyl) and electron capture detector (ECD). The operating parameters of GC were: carrier gas flow, 60ml min^{-1} , injector temperature 280 ^{0}C , oven temperature programme was 150 ^{0}C (5 min) increasing @ 8 ^{0}C min up to 190 ^{0}C (2 min.), further increased @ 15^{0}C min^{-1} up to 280 ^{0}C (10 min) with split ratio 1: 10. The retention times observed for bifenthrin was 18.480 min and for λ-cyhalothrin was 19.427 min.

IV. Result and Discussion

Residue data of both the insecticides i.e bifenthrin and λ-cyhalothrin at different soil depths are given in Table 2 and 3, respectively. The results showed that the insecticides leached up to the depth of 15 cm at 300 mm rainfall condition. The highest concentration of both the insecticides was found at 0-5 cm depth in both the application rates and it was higher at T_2 dose as compared to T_1. Bifenthrin was retained between 89-92 per cent in 0-5 cm core of soil and only 0.54-1.07 per cent residues were retained in 10-15 cm core of soil at single and double dose, respectively showing very low mobility of bifenthrin.

Retention of λ-cyhalothrin in soil cores was comparatively more than bifenthrin in both the doses. The retention was 94.41 – 95.91 per cent in the core of soil 0-5 cm at respective doses. Retention was quite low i.e 0.55-0.57 per cent in 10-15 cm soil core, showing immbobility of λ-cyhalothrin in soil. Among the two insecticides, the mobility of λ-cyhalothrin was found to be less than that of bifenthrin which can be attributed to low solubility (0.005 mg L^{-1}) of λ-cyhalothrin in water whereas solubility of bifenthrin in water is 0.1mg L^{-1}. None of the fractions contained residues of any insecticides in both the doses. Hence both the insecticides are seems to be safe for ground water. Manoj and Gajbhiye (2007) reported similar results i.e mobility of bifenthrin in soil was low. Its residues remained with in top 15 cm and more than 99 percent of residues were recovered from top 0-10 cm layer.

Tariq et al; (2006) observed the highest concentrations of λ -cyhalothrin in the top 0–10 cm layer. Gupta and Gajbhiye (2002) reported that the residue of β-cyfluthrin was recovered more than 99 percent from 0-5 cm depth. The possibility of its leaching to ground water is negligible because of its immobility. Hill and Inaba (1991) also reported the similar results that λ- cyhalothrin did not leach out of the top 2.5 cm of soil after application of 102 cm of water, i.e., 2 times the annual rainfall). No residues were detected in any leachate. No leaching was found by Sakata et al; (1986) in case of cypermethrin in all the three types of soils. Hence the results of the present studies have been well corroborated by the findings of other researchers.

V. Acknowledgements

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Table1 : Physical properties of soil.

Soil type	Sand (%)	Silt (%)	Clay (%)	pH	EC (dSm^{-1})	O.C.	P_2O_5 ($kg\ ha^{-1}$)
Sandy loam	28	24.3	42.0	7.6	2.0	0.67	15

Table 2 : Leaching behaviour of bifenthrin in sandy loam soil.

Soil Column Depth (cm)	Residues ($mg\ kg^{-1}$)*	
	Single dose (2 μg) ±SD	Double dose (4 μg) ±SD
0-5	1.62±0.005	3.44±0.015
5-10	0.19±0.011	0.26±0.008
10-15	0.01±0.003	0.04±0.001

* Average residues of three replicates
Leachate contained no residues

Table 3 : Leaching behaviour of λ-cyhalothrin in sandy loam Soil.

Soil Column Depth (cm)	Residues ($mg\ kg^{-1}$)*	
	Single dose (2 μg) ±SD	Double dose(4 μg) ±SD
0-5	1.69±0.301	3.52±0.211
5-10	0.09±0.007	0.13±0.030
10-15	0.01±0.001	0.04±0.006

* Average residues of three replicates
Leachate contained no residues

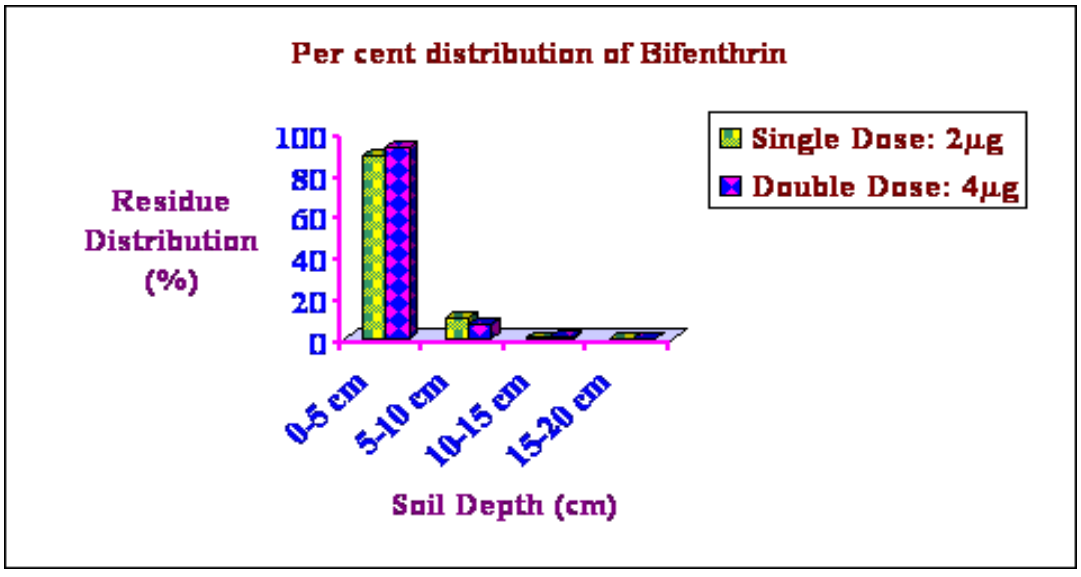

Figure 1 : Distribution of bifenthrin at different soil depths at two doses.

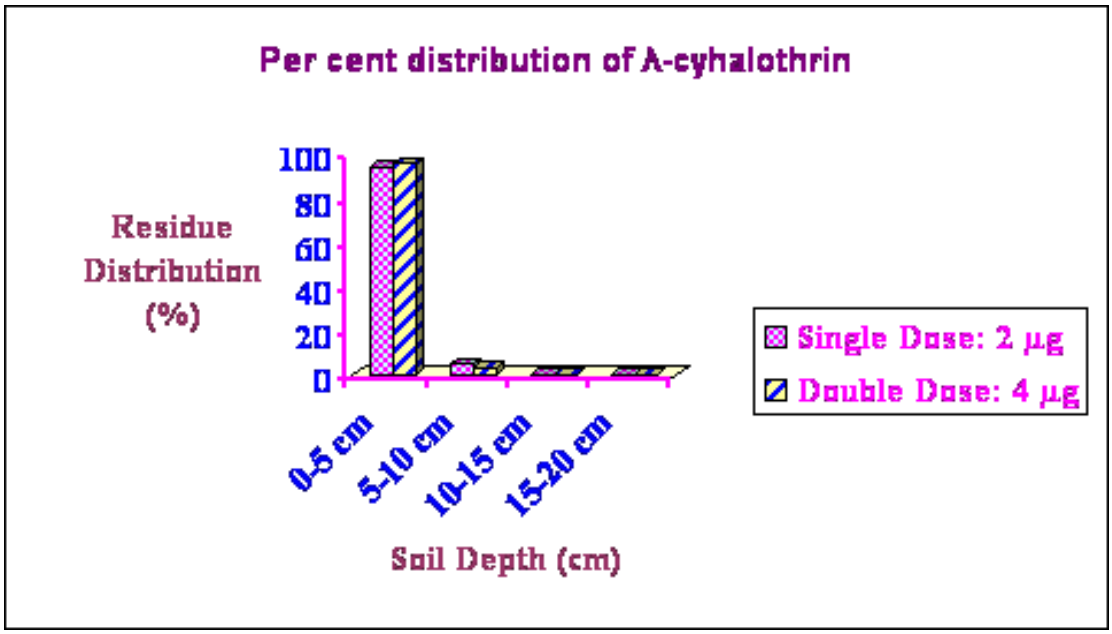

Figure 2 : Distribution of λ-cyhalothrin at different soil depths at two doses.

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Yeast Culture (*Saccharomyces cerevisae*) Supplementation: Effect on the Performance and Gut Morphology of Broiler Birds

By Adebiyi, O.A., Makanjuola, B. A., Bankole T.O & Adeyori A.S

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Abstract - A total of ninety six day-old broiler chicks were used for this study. The birds were allotted to four dietary treatments in a completely randomized design. Each treatment had 3 replicates and there were eight birds per replicate. All birds were kept under the same managerial, environmental and hygienic conditions. The diets were formulated on isocaloric (3000.00kcal/kgME) and isonitrogenous (23.00% Crude Protein) levels. T1 (control), T2 (1g/kg yeast supplementation), T3 (1.25g/kg yeast supplementation), T4 (1.5g/kg yeast supplementation) were fed to the birds on each treatment. Data on performance (feed intake, weight gain and feed conversion ratio) and gut morphology were collected. Data were subjected to analysis of variance (ANOVA) procedure of SAS, 2010. No significant differences were observed in the weight gain of the birds in the treatments. However, birds fed T2 had the least significant feed conversion ratio (2.10kg) when compared with their counterparts on the T1 (2.34kg).

Keywords : *Broiler bird, yeast culture, gut morphology, nutrient absorption.*

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Abstract - A total of ninety six day-old broiler chicks were used for this study. The birds were allotted to four dietary treatments in a completely randomized design. Each treatment had 3 replicates and there were eight birds per replicate. All birds were kept under the same managerial, environmental and hygienic conditions. The diets were formulated on isocaloric (3000.00kcal/kgME) and isonitrogenous (23.00% Crude Protein) levels. T1 (control), T2 (1g/kg yeast supplementation), T3 (1.25g/kg yeast supplementation), T4 (1.5g/kg yeast supplementation) were fed to the birds on each treatment. Data on performance (feed intake, weight gain and feed conversion ratio) and gut morphology were collected. Data were subjected to analysis of variance (ANOVA) procedure of SAS, 2010. No significant differences were observed in the weight gain of the birds in the treatments. However, birds fed T2 had the least significant feed conversion ratio (2.10kg) when compared with their counterparts on the T1 (2.34kg). The analysis of the ileum and jejunum showed that the villus height, cryptal depth, mucosa height and area of cryptal gland of birds fed T4 increased significantly ($p<0.05$) compared with birds fed T1. However, the result muscularis height showed that birds fed T3 had the highest mean value for ileum (403.71μm) and jejunum (396.84μm) while birds fed T1 had the lowest mean of 327.50 μm and 166.03 μm for ileum and jejunum respectively.

In conclusion, dietary inclusion of yeast culture at 1.5g/kg increased the growth performance and improved intestinal morphology and nutrient absorption.

Keywords : Broiler bird, yeast culture, gut morphology, nutrient absorption.

I. Introduction

Yeast microbes are probably one of the earliest domesticated organisms. People have used yeast for fermentation and baking throughout history. Studying the diversity of yeasts harboring the GIT of animals would be incomplete without consideration of the role that these microorganisms play for the host.

For a long time, yeast products have been successfully included in feed as natural growth promoters for animals and poultry. Many types of yeast have been fed to animals either in the form of yeast-fermented mash produced on farms, yeast by-products from breweries or distilleries, or commercial yeast products (Kemal *et al.*, 2001; Saied *et al.*, 2011). Yeasts are eukaryotic microorganisms classified in the kingdom Fungi. Yeasts are unicellular although some species with yeast forms may become multi-cellular through the formation of a string of connected budding cells known as pseudohyphae, or false hyphae, as seen in most molds. Yeast size can vary greatly depending on the species, typically measuring 3–4 μm in diameter although some yeasts can reach over 40 μm (Walker *et al.*, 2002). Most yeasts reproduce asexually by mitosis and many do so by an asymmetric division process called budding.

Saccharomyces cerevisiae also known "baker's yeast" is one of the most widely commercialized species and one of the effective adsorbents which is rich in crude protein (40-45%) and also rich in vitamin B complex, biotin, niacin, pantothenic acid and thiamin and its biological value is high (Reed and Nagodawithana, 1999). Whole yeast products or yeast cell wall components have been used to improve growth and affect the physiology, morphology and microbiology of the intestinal tract of turkeys (Bradley *et al.*, 1994; Hooge, 2004b; Sims *et al.*, 2004; Zdunczyk *et al.*, 2004; 2005; Huff *et al.*, 2007; Rosen, 2007b; Solis De Los Santos *et al.*, 2007; Huff *et al.*, 2010) and broiler chicks (Hooge, 2004a; Zhang *et al.*, 2005; Huff *et al.*, 2006; Rosen, 2007a; Yang *et al.*, 2008a,b; Morales-Lopez *et al.*, 2009).

Many researchers referred an advantage of culture yeast that are fed to animals as responsible for the production of vitamin B complex and digestive enzymes and for stimulation of intestinal mucosa immunity and increasing protection against toxins produced by pathogenic microorganisms (Sarker *et al.*, 1996; Martinez *et al.*, 2004; Silversides *et al.*, 2006). Some studies have confirmed that the effects of yeast culture could be an alternative to antibiotic-based drugs in feed for broiler chicks (Hooge *et al.*, 2003; Stanley *et al.*, 2004). It has been reported that feeding yeast to chicks improves body weight gain and feed:gain ratio (Bonomi and Vassia, 1978; Ignacio, 1995; Onifade *et al.*, 1999).

The aim of this study was to evaluate the effects of adding different levels of yeast culture to diets of

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broiler chicks on the performance characteristics and gut morphological integrity.

II. Materials and Methods

A total of ninety six day-old Arbor Acres strain broiler chicks were used for this study. The study was carried out at the Teaching and Research Farm of the University of Ibadan, Ibadan for a period of eight weeks. The birds were randomly allotted to four dietary treatments of 3 replicates each. Each replicate had eight birds.The experimental design was completely randomized design. The treatments were T1 (Control), T2 (1g/kg yeast supplementation), T3 (1.25g/kg yeast supplementation) and T4 (1.5g/kg yeast supplementa tion). All pens were bedded with wood shavings litter and equipped with feeders and drinkers. Fresh feed and fresh water were supplied *ad libitum*. Performance data (feed intake, weight gain and feed conversion ratio) were taken weekly. At 48 days of age, three birds from each replicate were slaughtered after 12 hours of fasting and samples of ileum and jejunum were taken. The specimens were fixed in 10% formalin after which they were dehydrated in 100% ethanol. The specimens were then cleared with xylene and embedded in paraffin. A microtome was used to make 5mm cuts that were mounted on glass slides and stained using the H and E (Haematoxyline and Eosin) method. Five readings each of villus height and crypt depth were taken per specimen. This was done with a light microscope (Olympus). Villus height was measured from the apical to the basal region which corresponded to the superior portion of the crypts. Crypts were measured from the basis until the region of transition between the crypt and the villus. All data were subjected to analysis of variance (ANOVA) using the general linear model (GLM of SAS) 2010

III. Results and Discussion

Table 1 : The Gross Composition of Experimental Diets.

Ingredient (Kg)	Starter	Finisher
Maize	58	56.5
Groundnut cake	21	18
Soybean Meal	14.6	19
Palmkernel Cake	1	0
Wheat	0	1.5
Fish	2	0
Bone	2.4	1.5
Oyster Shell	0	2.5
Premix (Broiler)	0.25	0.25
Salt	0.25	0.25
Lysine	0.25	0.25
Methionine	0.25	0.25
Total	100	100
Calculated Nutrient		
Crude Protein (%)	23	20.00
Metabolizable Energy (Kcal/Kg ME	3,019.27	3,000.00
Crude Fibre (%)	3.3	3.5

No significant differences were observed in the values of the weight gain of the birds on the different dietary treatments. This is in agreement with the findings of Al-Mansour *et al.* (2011). The authors reported that yeast levels did not significantly affect body weight gain. Significant differences were however observed the feed intake and feed conversion ratio values of the birds on the different dietary treatments. Birds fed T1 had the highest feed intake (3.09kg) and FCR (2.34kg) while birds fed T2 (1g/kg) had the lowest feed intake (2.47kg) and FCR (2.10kg). This is in agreement with reports by Gao *et al.* (2008). The authors supplemented yeast culture to broiler diets at the rate of 0, 2.5g/kg, 5g/kg and 7.5g/kg of feed. They reported that there was a quadratic effect of concentration of yeast culture on performance with the lowest concentration (2.5g/kg) being the most effective, however the improved growth performance with was not attributed to the increased feed consumption. In terms of feed conversion ratio, the results showed that birds fed T2 (1g/kg) and T4 (1.5g/kg) diet had better FCR than birds on the other treatments. The result of this research is similar to what was observed by Paryad and Mahmoudi (2008) when different levels of yeast culture was supplemented in the diet of broilers and improved body weight, feed intake and feed conversion ratio was observed at 1.5% yeast inclusion. Yeast culture contains yeast cells as well as metabolites such as peptides, organic acids, oligosaccharides, amino acids, flavor and aroma substances, and possibly some unidentified growth factors, which have been proposed to produce beneficial performance responses in animal production. In agreement with this study, beneficial effects of yeast culture on performance were also observed in broiler chicks (Zhang et al., 2005). Other studies, however, reported that yeast products had no effect on performance in turkey poults (Bradley and Savage, 1995) and early weaned pigs (White et al., 2002). Differences in animal response may be related to differences in product formulations: yeast products are interchangeably classified as active dried yeast, live YC, or fermented YC as reported by Gao *et al.* (2008).

Table 2 : Performance characteristics of broilers fed diets supplemented with different levels of yeast.

Parameters (Kg)	T1 (Control)	T2 (1g/kg)	T3 (1.25g/kg)	T4 (1.5g/kg)	SEM
Initial Weight	0.26	0.27	0.27	0.27	0.006
Final Weight	1.58	1.44	1.49	1.49	0.028
Weight Gain	1.32	1.17	1.22	1.23	0.027
Feed Intake	3.09[a]	2.45[b]	2.75[ab]	2.69[ab]	0.097
FCR	2.34[a]	2.10[b]	2.23[ab]	2.18[ab]	0.032

[ab] Means with different superscript on the same row are significantly different ($p<0.05$)

SEM- Standard Error of Means, T- Treatment, FCR- Feed Conversion Ratio

Table 3 shows the morphological indices of broilers fed different levels of yeast. The results showed an increase in villus height, cryptal depth, mucosa height and area of cryptal gland with increasing level of yeast supplementation where birds fed T4 had the highest mean value. However, the result for the muscularis height showed that birds fed T3 had the highest mean for both ileum (403.71μm) and jejumun (396.84μm) while those on T1 had the lowest mean of 327.50μm and 166.03μm for ileum and jejunum respectively. From this result it can be deduced that increase in the villus height suggests an increased surface area capable of greater absorption of available nutrients (Caspary, 1992). Likewise, greater villus height increases the activity of enzymes secreted from the tip of the villi resulting in improved digestibility (Hampson, 1986). Cell wall components of yeast may provide a protective function to mucosa by preventing pathogens from binding to villi and allowing fewer antigens to be in contact with the villi. Taller villi indicate more mature epithelia and enhance absorptive function due to increased absorptive area of the villus. The better performance observed in birds fed T4 could be due to the increase in the villus height which resulted into increased absorption of available nutrients.

It can therefore be concluded that adding supplemental yeast to the diets of broiler birds at 1.5g/kg will improve the performance gut integrity and nutrient utilization.

Table 3 : Gut Morphology of Broilers fed diets supplemented with different level of yeast.

Parameters (μm)	T1 (Control)	T2 (1g/kg)	T3 (1.25g/kg)	T4 (1.5g/kg)	SEM
Ileum					
Villus Height	491.36[ab]	456.61[b]	557.86[a]	566.60[a]	13.84
Cryptal Depth	336.80[b]	282.52[c]	317.93[bc]	456.47[a]	9.15
Muscularis Height	327.50	388.99	403.71	369.87	22.21
Mucosa Height	697.97[b]	526.21[b]	719.09[b]	1178.28[a]	43.69
Area of Cryptal Gland	13570.00[a]	6098.50[b]	6712.50[b]	7382.00[b]	362.50
Jejunum					
Villus Height	703.77[a]	452.44[b]	533.28[b]	500.51[b]	21.72
Cryptal Depth	582.10[a]	585.76[a]	352.95[b]	508.46[a]	20.48
Muscularis Height	277.77[b]	396.84[a]	304.92[b]	166.03[c]	8.65
Mucosa Height	248.76[a]	890.07[b]	903.07[b]	822.71[b]	43.28
Area of Cryptal Gland	11843.00	8123.00	9456.00	9772.00	873.77

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Variation of Attenuation of Bacteria Migration with Volume Flux Rate and Porosity in Porous Media

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VARIATION OF ATTENUATION OF BACTERIA MIGRATION WITH VOLUME FLUX RATE AND POROSITY IN POROUS MEDIA

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Variation of Attenuation of Bacteria Migration with Volume Flux Rate and Porosity in Porous Media

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Abstract - Efficiency of water treatment system grossly depends on the attenuation capacity of the filter media. Under natural condition, this capacity depends on the effects of physical, chemical and biological factors of which past works revealed few observation on physical factors under an explicit and simple experimental designs. In this work, we examined the variation of volume flux rate and porosity on the attenuation of migration of bacteria in sand media as can be applicable to water treatment system. Movement of Escherichia coli through matrix of different porosities in trends was studied in down – flow column experiment under natural and intermittent transport. Porosity values range between 0.28 and 0.42 while volume flux rate range between 0.82 x 10-4 m/s and 195.93 m/s respectively. The plot of normalized concentration versus volume flux was best fitted with polynomial curve of second degree which shows that attenuation of migration was partially varies with volume flux and not linear as revealed in past works. However attenuation of bacteria migration depends on the porosity as a function of depth '$\phi(x)$'.

I. Introduction

Availability of quality water for domestic, industrial and agricultural use has a great challenge to the water resources researcher. Technologically, more effort have arose to avert the increasing contamination of shallow aquifer by chemical waste, septic wastes and microbial pathogen which has led to considerable interest in the study of transport of bacteria in porous media. Also, onsite systems for waste water treatment are increasingly used in small towns, suburban and rural areas in many countries. In U.S, decentralized systems serve approximately 25% of the population (USEPA, 1997). Percolation through a natural or engineered porous media is the most frequently used treatment systems. Migration can lead to microbial contamination of groundwater resulting in outbreaks of waterborne disease (Craun et al.,1985, Yates et al.,1988 and Corapcioglu et al.,1984).

In the U.S,contaminated of groundwater causes almost half of the outbreaks of waterborne disease each year (Craun et al.,1985), and septic tank effluents is the most frequently reported source of groundwater contamination (USEPA 1977). In developing country Such as Nigeria where there is little availability of water regardless of its quality, there is need for a plan into onsite systems for wastewater treatment and the protection of the groundwater where boreholes and wells, streams serve as the main sources of water for drinking and domestic use (Ibe et al., 2005).

To locate, design and operate an onsite system, and to limit/avoid migration of pathogenic bacteria through the system, knowledge of the mechanisms and factors that influence their movement is required (Tor kristian et al.,2004). More so, considerable interest in the factors controlling the transport and the fate of microorganism in porous media a result of concern about the contamination of surface water and groundwater with pathogenic microorganisms.Whenever any groundwater supply well is constructed, a viable groundwater measure must be put in place to prevent contamination by pollutant; one approach is to control/removal of contaminants using a natural media of an appropriate porosities (Leonards, 1962 and Silliman et al., 1998).

Soil serve as a natural filter and its ability to do so depends on its physical properties such as permeability and porosity (Henry, 2003).Natural filter have been used as landfill liners to reduce the movement of contaminant fluid from solid waste landfill and waste water disposal into subsurface (Benson et al.,1990 , Benson et al., 1995, Benson et al., 1994, Boadu,2000, foreman et al., 1986, Henry, 2003 and Rowel et al., 1995).Soil when used as a filter serve as hydrogeological barrier. Hydrogeological barrier is defined as the physical, biological and chemical factors singly or in combination that protect a well from pathogenic organism. The removal of microorganisms during infiltration in porous media normally attribute to combination of straining, adsorption and inactivation. The efficiency of these processes is related to several factors (Antonina et al., 2009). Straining is influenced by the physical characteristics of the filter medium, hydraulic loading and clogging (Antonina et al., 2009). Adsorption is controlled mainly by the grain surface characteristics of the porous medium, water flow velocity, waste water ionic strength, pH, moisture content and cell surface characteristics (Auset et al., 2005).

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The efficiency of most of these processes is therefore related to physical flow conditions, and studies on the removal of microorganisms should consider all the parameters that affect hydraulics during infiltration in porous media (i.e hydraulic parameter of the filter material and filter depth).

Intermittent transport is slow, discontinuous migration of bacteria through an aquifer. The contribution of discontinuous transport to the movement of bacteria through aquifer has not been studied (Harvey, 1989). Discontinuous transport may be an important in the movement of bacteria through the subsurface over geological time and may be important as a mechanism by which large areas of contaminated aquifers are eventually seeded with waste-adapted bacteria. Many studies on the transport of bacteria in porous media focused on geological factors in addition to the biological and chemical factors contributing to the retention and removal of pathogenic organism but neglect the effects of hydrological characteristics of the media i.e physical flow condition.

The purpose of this work is to examine the effects of volume flux (refer as hydraulic loading) and the porosity on the attenuation of bacteria migration in saturated porous media using an intermittent mechanism.

II. Materials and Method

In this work, two independent experiments were carried out, one to determine the flow parameters of the sand media i.e the volume flow rate, seepage velocity refer to as average pore water velocity as given by

$V = \frac{q}{A\phi}$ (Jacob and Armold, 1990)

Where v is the seepage velocity (ms^{-1}), q is volume flux (ms^{-1}) and ϕ is porosity.

While the second set is to determine the attenuation of bacteria migration using the media with pre-determined physical flow characteristics.

Sample preparation: Sand was collected from the river bed in Osun River along Iwo-Gbongan road, Osun state. The sand were thoroughly washed with water and later with deionised water, boiled with 1M hydrochloric acid for two hours and latter treated with 1M of NaOH to remove metallic oxide coating on the sand and equilibrate the pH respectively. The treated samples of the sand were washed again with deionised water, sundried and stoney pebbles were removed. Samples were sieved with different mesh sizes to get different grain sizes. The mesh sizes used were 150μm, 212μm, 300μm, 425μm and 600μm. Each particle sizes of different grain size were packed into clear jars and sterilized with dry heat oven at 160° for 48 hours.

a) Determination of physical flow parameter

The porosity of each of sample was determined by volumetric approach using basic parameter.

$$\text{Porosity} = \frac{pore\ volume}{bulk\ volume} = \frac{Bulk\ volume - Grain\ volume}{Bulk\ volume}$$

In this experiment, bulk and grain volumes were determined volumetrically by measured 3ml of dried sand into 10ml measuring cylinder, the sand were thoroughly compacted before value of volume was recorded. A similar cylinder was half filled with water and volume was noted. The sand were then poured into the water and the final volume of the mixture (water and sand) was recorded (Adegoke, 2005).

Porosity was calculated as following

Volume of sand (bulk volume) = x (ml)

Volume of water = y (ml)

Volume of mixture of water and sand = z (ml)

Total porosity 'ϕ' = $\frac{(x+y)-z}{x}$

Volume flux rate q for each sample at different hydraulic gradients were determined using a transparent glass cylinder (pyrex tube) of length 1m and 2.79cm in diameter. The cross-sectional area is 6.12 x 10^{-4} m^2. To ascertain uniform compaction throughout the sample, the screened end was blocked so as to prevent the water from draining down t ensure complete saturation when transferring the sample into the column. A continuous steady supply of water was fed through the sand samples of length 'l' and at height 'h', a hole was drilled, this enabled the constant height to be maintained; as excess water got drained through an overflow arrangement. The volume of the discharge 'Q' through the sample for a period of 60sec after steady state has been attained at constant head was measured by measuring cylinder. The length of the sand used were 10cm, 20cm, 30cm, 40cm and 50cm to get varied hydraulic gradient and in resonant with the design of the flow through experiment (filtration of bacteria). The results of this experiment were used to plot the graph of volume flux against hydraulic gradient and the slope of the graph gives hydraulic conductivity. The permeability was then computed using equation

$$K = \frac{\rho g}{g} k$$

From which k is written as 'k = $\frac{K\,\mu}{\rho g}$

Where, K = hydraulic conductivity (ms^{-1})

K = Permeability (m^2)

μ = Viscosity of fluid (Nsm^{-2}) and

μ/ρ = Kinematics viscosity (water) = 1 x 10^{-6} m^2s^{-1}

b) Filtration experiments

The experiment was carried out in Environmental laboratory, Department of microbiology, university of Ibadan. The prepared microorganism –

bacteria used- Escherichia coli were collected from the same laboratory. Exactly 1ml of the suspension was serial diluted and plated to determine the colony forming unit per milliliter (CFU/ml).

Glass column (1m long, 2.79cm diameter) Pyrex used to determine the physical flow parameter were washed and disinfected with 97% ethanol and sterilized in hot air oven at 120° for 2 hrs. The column cylinder was covered with muslin cloth at outlet to prevent water passage. The saturated sand was then poured into the column up to height 'h' equal 10cm corresponding to hydraulic gradient of 1.600 under gravitational pull. The column was repeatedly tapped during packing to prevent any entrapment of air bubble with the pore space (Carl et al, 2006). The cover was removed and water was allowed to pool down, until the dripping water from the column has a frequency of one drop per 10 seconds. Then, 2ml of bacterial suspension of known concentration was dropped onto the sand bed in the column with aids of 5ml sterile syringe and this was followed by intermittent supply of bacteria- free water (distilled). The effluents of the column were collected and analyzed for the bacteria load. This was done five times for different rainfall simulation. The effluents were subjected to microbial analysis using pour plate technique for bacteria count. These were normalized to the respective influent concentration.

III. Results and Discussion

Table 1 showed the results of porosity for five samples which range between 0.28 and 0.42 with hydraulic conductivity ranging from 0.230 x 10-3 m/s to2.721 x 10-3 m/s. The values of these porosities give the Reynolds number that range between 0.123 and 11.76 for the lower and upper bound of the flow rate at 0.82 x 10-4 m/s and 195.93 x 10-4 m/s respectively for all the samples considered. Table 2 and 3 showed the value of volume of discharge and volume flux rate 'q' for sample A to E and at the following hydraulic gradient (1.600, 2.000, 2.667, 4.000 and 8.000) which are equivalent to the five depths of the samples considered in filteration experiment. Table 4 showed the computed average value of normalized concentration (C/Co) for five drains at different porosities. The reason for normalization is to limit the error that may arise as a rsult of unequal influents concentration.

Table 1 : Values of porosity for the five samples using volumetric approach.

Samples	A	B	C	D	E
Porosity(ϕ)	0.28	0.36	0.37	0.40	0.42

Table 2 : Experimental determined values of volume of discharge 'Q' for samples at various hydraulic gradient (h+ L/L) for 60 sec, where L = length of the sand media in the column, h = height over which the head is loss.

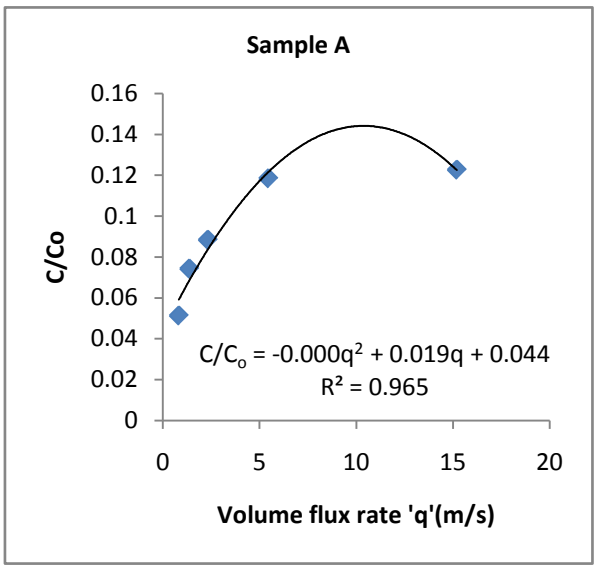
Hydraulic Conductivity (i)	Discharge Vol. (A) x 10^{-6} (m^3)	Discharge Vol. (B) x 10^{-6} (m^3)	Discharge Vol. (C) x 10^{-6} (m^3)	Discharge Vol. (D) x 10^{-6} (m^3)	Discharge Vol. (E) x 10^{-6} (m^3)
1.600	3.0 ± 0.01	11.5 ± 0.10	31.5 ± 0.11	48.0 ± 0.03	76.0 ± 0.02
2.000	5.0 ± 0.01	13.5 ± 0.02	42.0 ± 0.12	58.0 ± 0.03	128.0 ± 0.06
2.667	8.5 ± 0.02	23.0 ± 0.15	63.0 ± 0.14	84.0 ± 0.05	170.0 ± 0.10
4.000	20.0 ± 0.02	25.0 ± 0.10	108.0 ± 0.03	178.0 ± 0.07	289.0 ± 0.11
8.000	56.0 ± 0.15	104.0 ± 0.02	286.0 ± 0.06	410.0 ± 0.14	719.0 ± 0.15

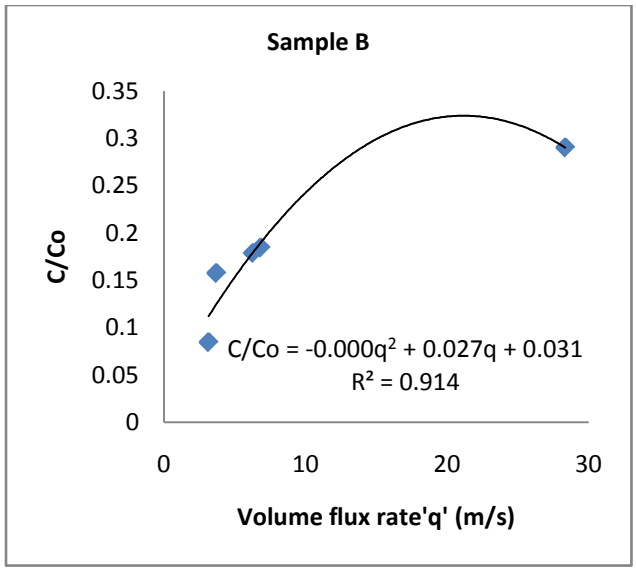
Table 3 : Experimental determined values of volume flux rate 'q' for samples at various hydraulic gradient (h +L/L).

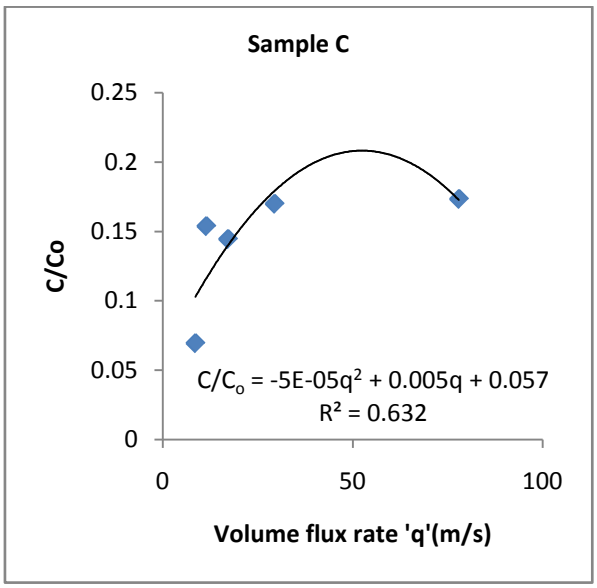
Hydraulic gradient (i)	Volume flux'q' (A) x 10^{-4}(m/s)	Volume flux'q' (B) x 10^{-4}(m/s)	Volume flux'q' (C) x 10^{-4}(m/s)	Volume flux'q' (D) x 10^{-4}(m/s)	Volume flux'q' (E) x 10^{-4}(m/s)
1.600	0.82 ± 0.01	3.13 ± 0.10	8.58 ± 0.11	13.08 ± 0.03	20.71 ± 0.02
2.000	1.36 ± 0.01	3.68 ± 0.02	11.45 ± 0.12	15.81 ± 0.03	34.88 ± 0.06
2.667	2.32 ± 0.02	6.27 ± 0.15	17.17 ± 0.14	22.89 ± 0.05	46.33 ± 0.10
4.000	5.45 ± 0.02	6.81 ± 0.10	29.43 ± 0.03	48.51 ± 0.07	78.16 ± 0.11
8.000	15.20± 0.15	28.34± 0.02	77.94 ± 0.06	111.70± 0.14	195.93± 0.15

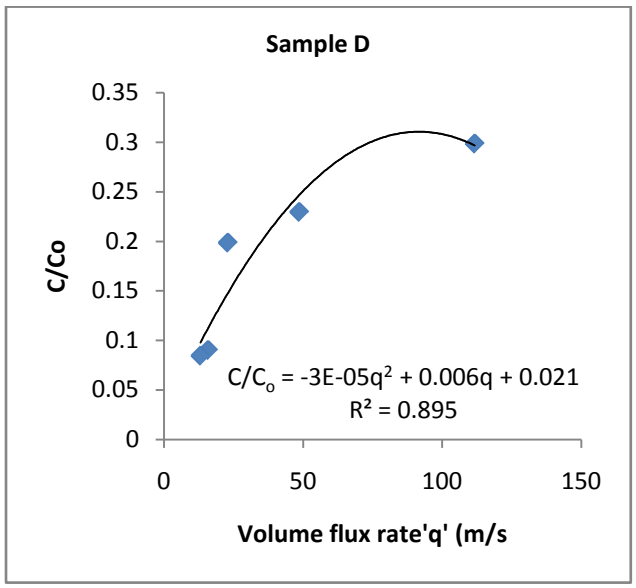
Table 4 : Computed average value of normalized concentration (C/Co) for five drains at different porosity for the five depths considered.

Porosity (ϕ)	10.00cm	20.00cm	30.00cm	40.00cm	50.00cm
0.28	0.1228	0.1186	0.0885	0.0744	0.0514
0.36	0.2904	0.1846	0.1789	0.1577	0.0846
0.37	0.1734	0.1699	0.1445	0.1538	0.0694
0.40	0.2986	0.2296	0.1986	0.0902	0.0845
0.42	0.3514	0.2972	0.1910	0.1164	0.0949









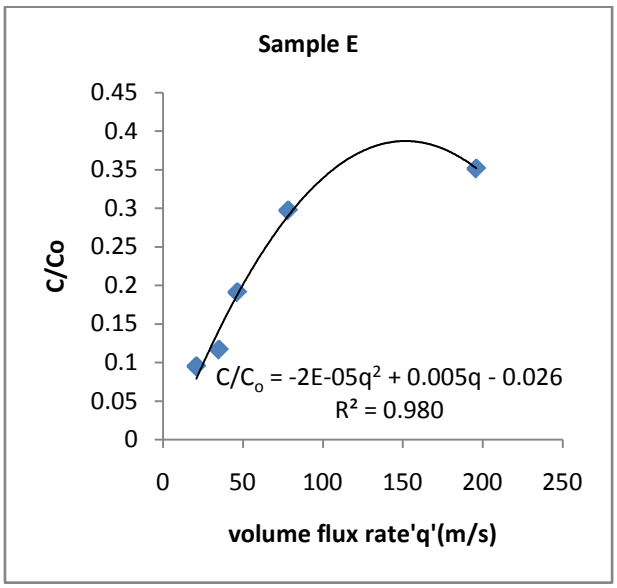


Figure 1 : Plot of normalized concentration versus volume flux in ms^{-1} .

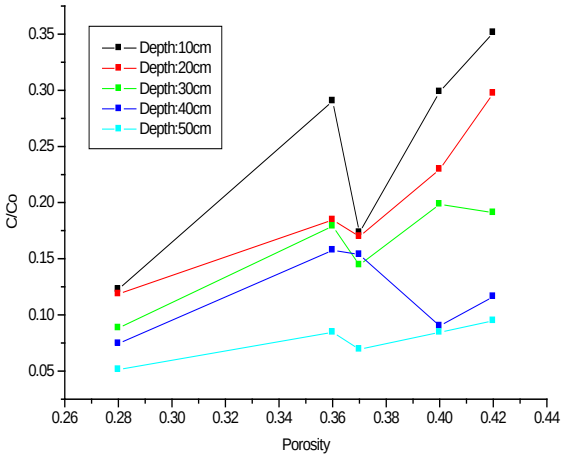


Figure 2 : Plot of average normalized concentration for five drains at different porosity for the five depths.
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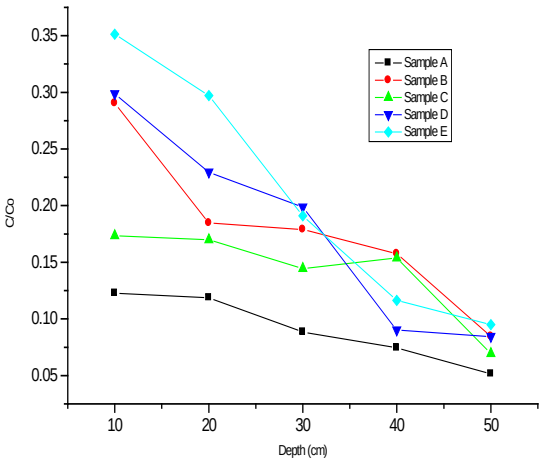

Figure 3 : Plot of average normalized concentration for five drains at different depths for the porosities

One of the relevance of this this research work is to have a deep insight into the mechanisms and the factors that influence the microbial migration as may be applicable to onsite waste water treatment system (OWTS) of which the soil characteristics the main controlling properties. Volume flux rate as well as porosity which were considered in this work convergently determine the effects of all other hydrological physical factors that may inluence the influx of pathogenic bacteria in subsurface. The variation of volume flux rate with bacteria load is shown in figure 1(a) to (b). Ploynomial curve give the best fit for the relationship. It shows for all samples that recovery of bacteria load is not linearly prroportional to volume flux rate as reported in other works. Theoretically, high flow rate increases the average water suction in an unsaturated filter medium.This result in greater transport through larger pores, which decreases the effect of bacteria straining byporous material (Thomas et al. 1979 and Bouma et al. 1974).

Blombat et al. 1994 and Ausland et al. 2002 observed a higher removal of fecal coliform bacteria in filtration systems using uniform pressure distribution compared to gravity dosing. Our result is in partial agreement with these but it was observed for all samples (different porosities) that as the volume flux refered to hydraulic loading increases, the recovery of bacteria increase to a point where it begins to decreases as volume flux rate increases as this increment of flux will continuously reducing the pores size within the mediaas time increases. Smith et al.1985 reported that the retention of bacteria in soil was inversely related to the rate at which water was applied to a filter. This is not in resonant with the work of thomas et al. 1994 and Bouma et al., 1974. The limitation in their work is as a result of experimental design which did not considered the trends of application but mere of low and high flow rate.Consideration of this trends enable us to unveil the actual relationship between the recovery of the bacteria and the flow rate. Adsorption and desorption of bacteria within the column contribute to the outcome of our findings. Husman and verstraete, 1993 observed that transport of bacteria in filters was much greater when water was applied at rate of 4.7 m/s than 0.8 m/s. High flow rate increases the water movement through macropores (Bouma and Thomas) but reduces the displacement (Thomas). This reduces the contact time between the bacteria cell and the grain surface, and greater distance which decreases the rate of adsorption (Yates et al. 1988, Lance et al.1984, sharma et al. 1992).

Figure 2 showed the plot of average normalized concentration of bacteia elutes for five drains at different porosities for depths considered. This outcome revealed that attenuation of migration of bacteria depend on porosity for all depths but it is critically shown that the higher the depth the higher the degree of attenuation which is due to reduction in the pore sizes vis- a- vis porosity. It was observed for allthe depths that there is geometric increase in attenuation between media porosity between 0.36 and 0.37, this may be as a result of insignificant different between the two point. As porosity increases the permeability increases which leads to larger magnitude of effluent recovered, thus lower the attenuation. Random motility will be reduced more profoundly in the smaller pores as shown in figure 3. The attenuaton capacity of media with lowest porosity is greater than others in all the depths considered. This findings will not only be useful to the design of good filter as use in slow and rapid sand filter but also in all area of environmental issues that involves the protection of groundwater from contaminants.

IV. Conclusion

The research work examines the variation of attenuation of migration of bacteria with volume flux and

porosity on sand media under saturated condition. In order to better understand and protect the quality of groundwater, an understanding of the processes controlling contaminants (virus, bacteria and protozoa) form an important class of pollutants that pose a significant threat to public health due to their occurrence in drinking water. It was observed in this research work that the use of sand media on attenuation of bacteria migration is highly significant and when designing a filter media for water treatment, all other factors controlling the attenuation must consider the porosity and volume flux as a prime factors that determine the influence of both biological and chemical factors on microorganisms transportation, hence their reduction in water treatment facilities.

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3. Submission of Manuscripts,

4. Manuscript's Category,

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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.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

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
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- 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.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- 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.

Figures and tables

- 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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- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

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- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- 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:

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- Submit to work done by specific persons (including you) in past tense.
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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
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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

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