Results and Discussion

4. RESULTS AND DISCUSSION

Antioxidants from natural substances such as plants, spices and herbs that are consumed as foods or ingredients have been widely investigated for several biochemical and pharmacological properties (Adaramoye *et al.*, 2005). Increased generation of reactive oxygen species (ROS) and lipid peroxidation have been found to be involved in the pathogenesis of many diseases of known and unknown etiology and in the toxic actions of many compounds. The endogenous antioxidant enzymes are responsible for the detoxification of deleterious oxygen radicals (Sathisekar and Subramanian, 2005). Scientific evidence validates the pharmacological action of medicinal plants. Structural diversity of medicinal herbs makes them valuable source of novel lead compounds against therapeutic targets that are newly discovered by genomics, proteomics and high-throughput screening (Suk, 2005).

Enzymic antioxidants namely Catalase, Peroxidase, Superoxide dismutase, Polyphenol oxidase, Glutathione-S-transferase, Glutathione peroxidase, Glutathione reductase and non-enzymic antioxidants such as Ascorbic acid, α-Tocopherol, Reduced glutathione, Polyphenols, Carotenoids and Lycopene were analysed in seed, leaf, seed mixture and leaf mixture of the selected medicinal plants *Syzygium cumini* and *Momordica charantia*. The Protein and Carbohydrate contents were also identified in the above samples. The free radical scavenging potential of the plant samples was evaluated in terms of inhibition of *in vitro* lipid peroxidation, superoxide and nitric oxide generation. The antibacterial activity was identified in the alcoholic extracts of the various plant samples. The antidiabetic effect was also determined in the seed sample of the two different plants.

The findings of the present study are discussed under the following headings :

4.1 Antioxidant Potential of the Plant Samples

4.1.1. Enzymic antioxidants

4.1.2. Non enzymic antioxidants

4.2. Protein and Carbohydrate Content

4.3 Free radical scavenging effect of the Plant Samples

4.4 Antimicrobial Activity of the Plant Samples

4.4.1 Screening of antibacterial activity by disc diffusion method

4.4.2 Antibiotic Sensitivity Test

4.4.3 Antibacterial activity of alcoholic extracts

4.5 Antidiabetic Effect of the Plant Samples

4.1 Antioxidant Potential of the Plant Samples

The levels of enzymic and non-enzymic antioxidants assessed in two different plant samples are collectively represented in the following tables.

4.1.1 Enzymic antioxidants

The levels of various antioxidative enzymes were determined and presented in Tables I and II.

Table I and Figure 1 reveal the activity of Catalase, Superoxide Dismutases, Peroxidase and Polyphenol Oxidase in the plant samples.

TABLE I

LEVELS OF ENZYMIC ANTIOXIDANTS IN THE PLANT SAMPLES

S.No	Plant screened	Enzymic antioxidants (U/g)			
		Catalase	**Peroxidase**	**Superoxide dismutase**	**Polyphenol oxidase**
1.	*Syzygium cumini*				
	Leaf	471.161	3.733	92.573	0.568
	Seed	1061.417	2.985	158.122	0.593
2.	*Momordica charantia*				
	Leaf	655.491	6.266	158.018	0.561
	Seed	368.958	7.809	16.471	0.295
3.	Leaf mix	478.650	4.343	24.474	0.700
4.	Seed mix	543.633	6.014	89.012	0.566
SEd		1.904	0.318	20.271	0.045
CD (0.05)		4.149	0.693	44.169	0.099

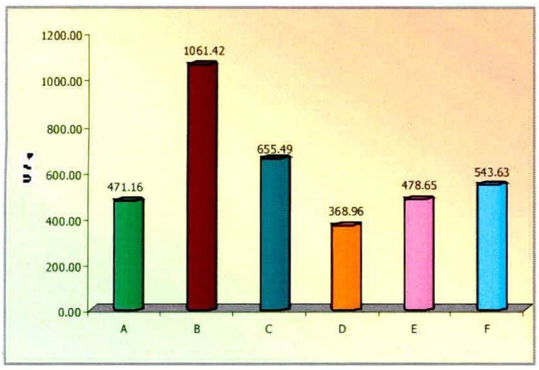
The values are mean of triplicates

Enzymes		**Units**
Catalase	-	Amount of enzyme required to decrease the optical density by 0.05 units
Peroxidase	-	1 μmole of pyrogallol oxidised /min
Superoxide dismutases	-	Amount that causes 50% reduction in the extent of NBT oxidation
Polyphenol oxidase	-	Amount of enzyme that transforms 1 μmole of dihydrophenol to 1 mole of quinones/min

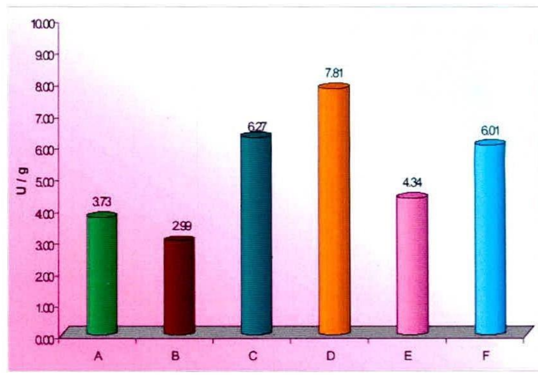
FIGURE 1

LEVELS OF ENZYMIC ANTIOXIDANTS IN THE PLANT SAMPLES

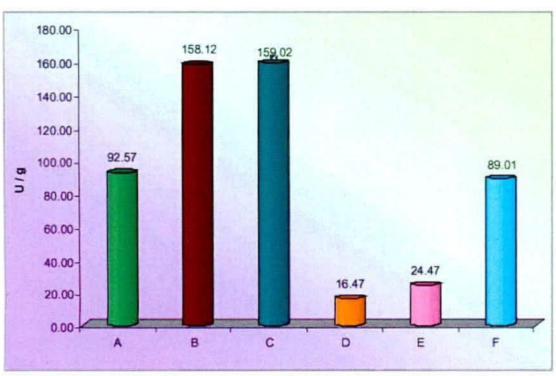
CATALASE



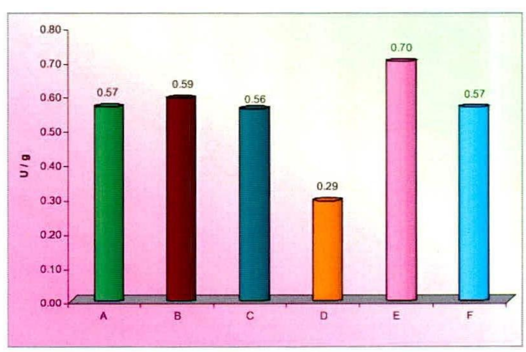
PEROXIDASE



SUPEROXIDE DISMUTASE



POLYPHENOL OXIDASE



A - *S. cumini* leaf
B - *S. cumini* seed
C - M. *charantia* leaf
D - M. *charantia* seed
E - Leaf mixture
F - Seed mixture

From the Table I and Figure 1 it is evident that the maximum activity of Catalase and Superoxide dismutase was observed in the seed extract of *Syzygium cumini* (1061.417 U/g, 158.122 U/g) whereas the seed extract of *Momordica charantia* was found to be the poorest source of the above mentioned enzymes(368.958 U/g, 16.471 U/g).But in the case of peroxidase the seed extract of *Syzygium cumini* registered the lowest value(2.985U/g) though it exhibited maximum activity for Catalase and Superoxide dismutase.

Studies on antioxidant enzymes revealed that the *Hyptis suaveolens* extract treated animals showed significant increase in the levels of superoxide dismutase and Catalase, the powerful antioxidant enzymes of the body that are known to quench superoxide radicals (Shirwaikar *et al.*, 2003). The extract of leaf mixture recorded the maximum activity of polyphenol oxidase (0.700U/g) and the minimum activity was shown by the seed extract of *Momordica charantia* (0.295U/g).

Some isoenzymes of peroxidases are reported to exhibit polyphenol oxidase (PPO) activity which are involved in active scavenging of oxygen radicals (Okpuzor and Omidyii, 1998).

Table II and Figure 2 represent the activity of Glutathione-S-Transferase, Glutathione Peroxidase and Glutathione Reductase in the extracts of *Syzygium cumini* and *Momordica charantia.*

TABLE II

LEVELS OF ANTIOXIDATIVE ENZYMIES IN THE PLANT SAMPLES

S.No	Plant Screened	Enzymic antioxidants (U/g)		
		Glutathione -S-transferase	Glutathione peroxidase	Glutathione reductase
1.	*Syzygium cumini*			
	Leaf	0.023	11.608	1.626
	Seed	2.908	29.036	2.594
2.	*Momordica charantia*			
	Leaf	0.030	8.926	5.578
	Seed	0.063	3.938	1.003
3.	Leaf mix	0.036	13.142	1.564
4.	Seed mix	0.124	9.372	1.300
S Ed		0.070	1.925	0.472
CD (0.05)		0.152	4.194	1.028

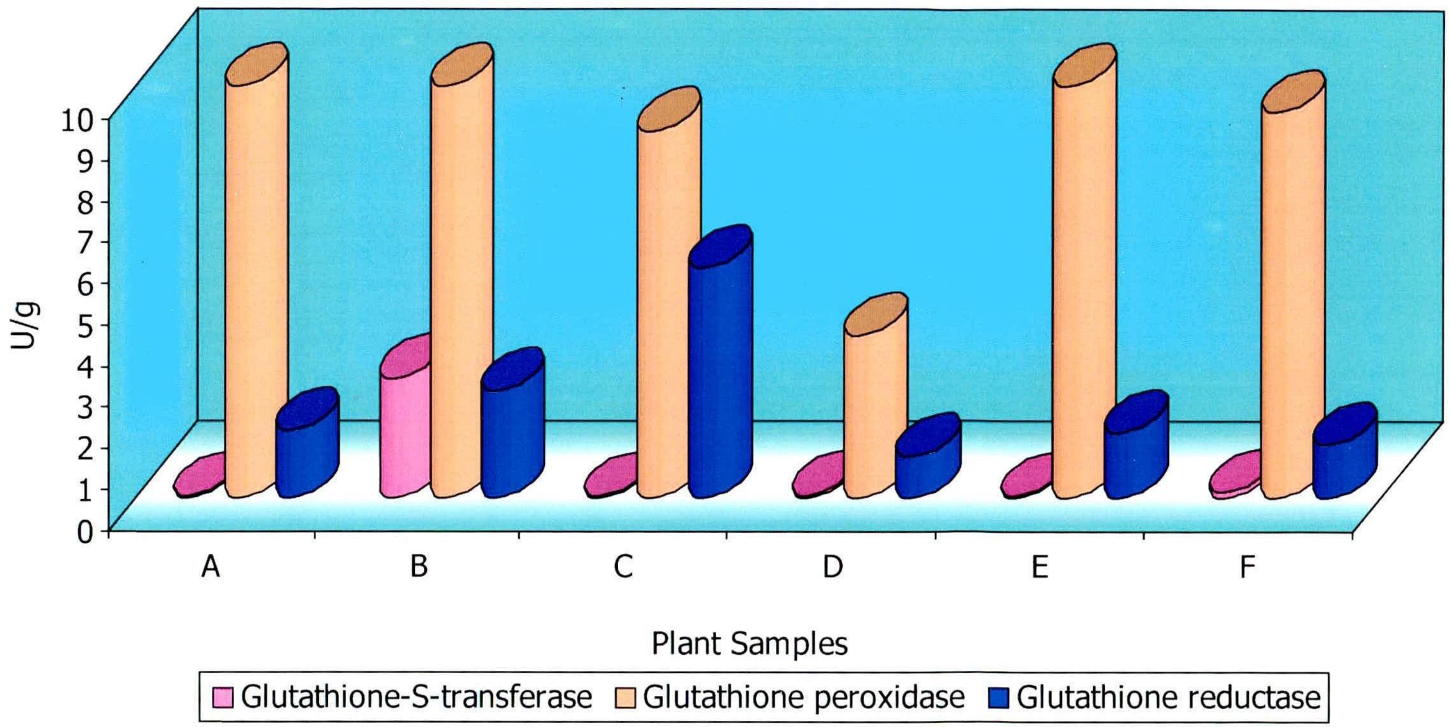
The values are mean of triplicates

Enzymes	Units
Glutathione-S-transferase	- µmoles of CDNB-GSH conjugate/min/g sample
Glutathione peroxidase	- µmoles of GSH consumed/min/g sample
Glutathione reductase	- µmoles of NADPH oxidized/min/g sample

The activity of Glutathione-S-transferase (2.908U/g) and Glutathione peroxidase (29.036U/g) was found to be the maximum in the seed extract of *Syzygium cumini* and the leaf extract of *Momordica charantia* showed the highest activity of Glutathione reductase (5.578 U/g). Least activity of Glutathione peroxidase and Glutathione reductase was noticed in the seed extract of *Momordica charantia* and Glutathione-S-transferase in the leaf extract of *Syzygium cumini*.

FIGURE - 2

LEVELS OF ANTIOXIDATIVE ENZYMES IN THE PLANT SAMPLES



A - *S. cumini* leaf **B - *S. cumini* seed** **C - M. *charantia* leaf** **D - M. *charantia* seed**

E - Leaf mix **F - Seed mix**

Ali *et al.* (2005) have reported that the increased level of enzymic antioxidants glutathione peroxidase and glutathione-S-transferase in root and leaves segments of Phalaenopsis led to the breakdown of oxidants such as H_2O_2, organic hydroperoxides and lipid hydroperoxide resulting in greater protection against oxidative damage.

4.1.2 Non-enzymic antioxidants

Table III and Figure 3 indicate the contents of Ascorbic acid, α-Tocopherol, Reduced Glutathione, Polyphenol, Carotenoid and Lycopene in the plant samples

TABLE III

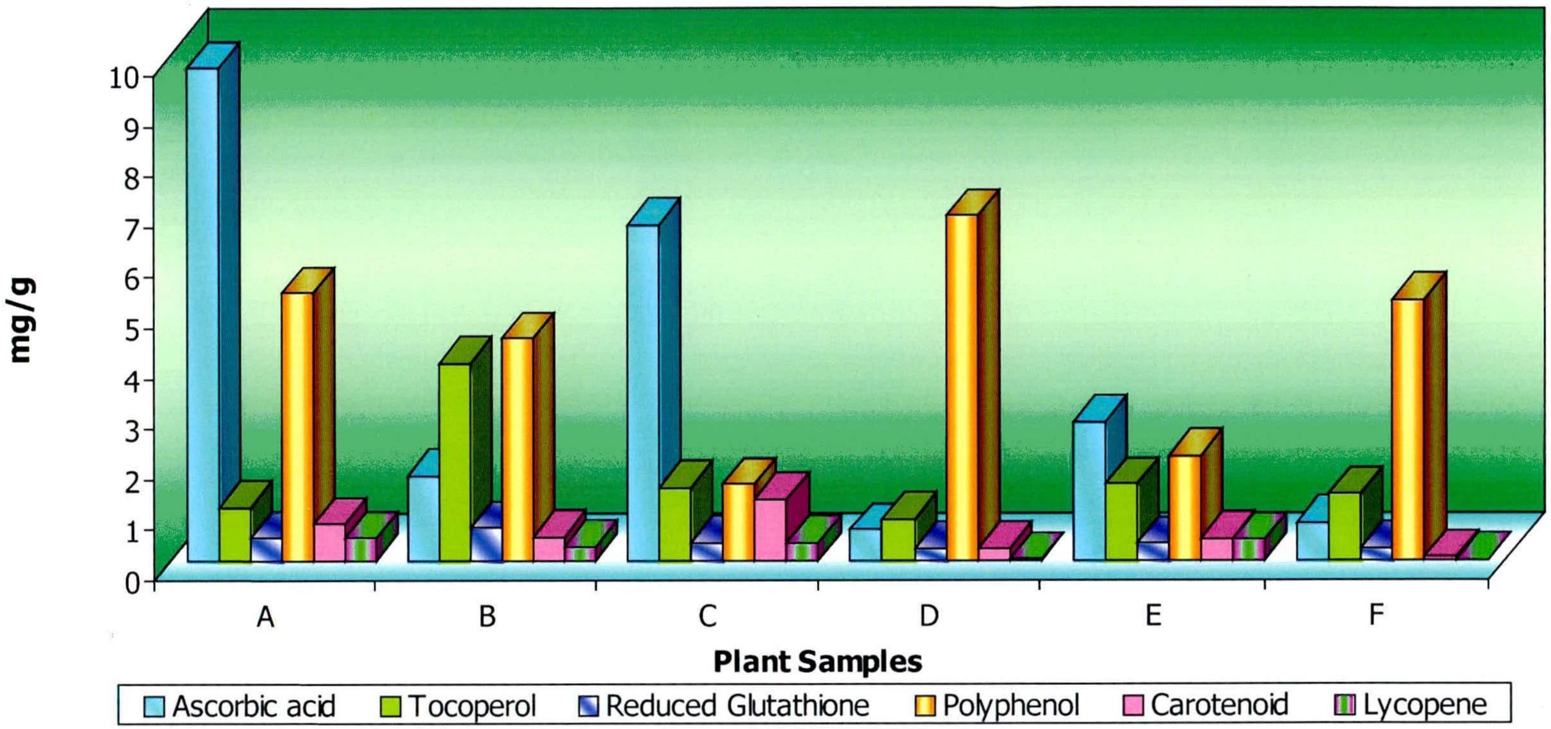
LEVELS OF NON-ENZYMIC ANTIOXIDANTS IN THE PLANT SAMPLES

S.No	Plant screened	Non-Enzymic antioxidants (mg/g)					
		Ascorbic acid	α – tocopherol	Reduced glutathione	Poly-phenol	Carot-enoid	Lyco-pene
1.	*Syzygium cumini*						
	Leaf	9.748	1.051	0.451	5.299	0.720	0.450
	Seed	1.686	3.900	0.640	4.394	0.468	0.263
2.	*Momordica charantia*						
	Leaf	6.648	1.445	0.348	1.507	1.217	0.361
	Seed	0.609	0.829	0.236	6.814	0.231	0.017
3.	Leaf mix	2.732	1.498	0.336	2.066	0.432	0.417
4.	Seed mix	0.753	1.312	0.229	5.160	0.055	0.011
S Ed		0.030	0.390	0.003	0.011	0.002	0.006
CD (0.05)		0.066	0.851	0.007	0.025	0.005	0.014

The values are mean of triplicates

FIGURE - 3

LEVELS OF NON - ENZYMIC ANTIOXIDANTS IN THE PLANT SAMPLES



A - *S. cumini* leaf B - *S. cumini* seed C - M. *charantia* leaf D - M. *charantia* seed

E - Leaf mix F - Seed mix

It is observed from Table III and Figure 3 that the content of α-tocopherol (3.900mg/g) and reduced glutathione (0.640mg/g) was found to be maximum in the seed extract of *Syzygium cumini* and the minimum amount was registered by the seed extract of *Momordica charantia* and seed mixture extract. The highest concentration of ascorbic acid was noticed in the leaf extract of *Syzygium cumini* (9.748mg/g) and lowest concentration in the seed extract of *Momordica charantia.*

Ascorbate and glutathione are the key non-enzymic antioxidants and participate in redox regulation in different cell compartments to protect plants from oxidative stress (Yin *et al.*, 2008).

The results of Pourmorad *et al.* (2006) showed that the extract of *Mellilotus officinalis,* which contain highest amount of flavonoid and phenolic compounds, exhibited the greatest antioxidant activity. The high scavenging property of *Mellilotus officinalis* may be due to hydroxyl group existing in the phenolic compounds' chemical structure that can provide the necessary component as a radical scavenger.

The highest polyphenol content was noticed in the seed extract of *Momordica charantia* (6.814mg/g) and the lowest amount in the leaf extract (1.507 mg/g) indicating the seed as the richest source and the leaf as the poorest source of polyphenol. Maximum amount of Carotenoid and Lycopene was found in the leaf extract of *Momordica charantia* and *Syzygium cumini* respectively (1.217mg/g and 0.450mg/g) and minimum concentration was shown in seed mixture extract (0.055mg/g and 0.011mg/g).

Thus the results obtained from the determination of various non-enzymic antioxidants revealed *Syzygium cumini* as the richest source of Ascorbate, α-tocopherol, Reduced glutathione and Lycopene and *Momordica charantia* as the richest source of Polyphenol and Carotenoid. The seed extract of *Momordica charantia* and the seed mixture were found to be the poorest source of all the non-enzymic antioxidants analyzed except polyphenol.

4.2. Protein and Carbohydrate Content

Table IV and Figure 4 show the Protein and Carbohydrate content of the plant samples

TABLE IV

PROTEIN AND CARBOHYDRATE CONTENT OF THE PLANT SAMPLES

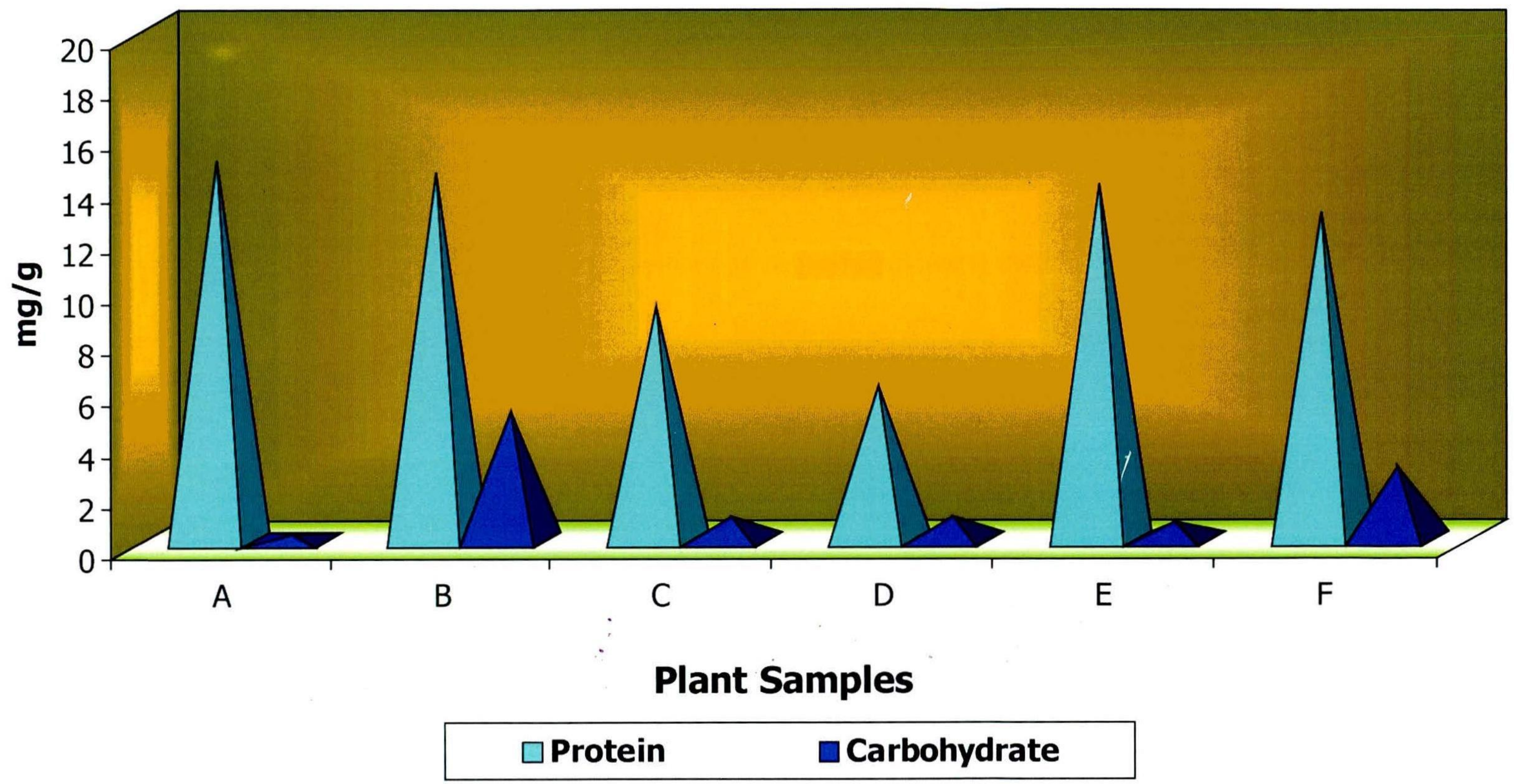
S.No	Plant Screened	Protein (mg/g)	Carbohydrate (mg/g)
1.	*Syzygium cumini*		
	Leaf	14.878	0.196
	Seed	14.416	5.007
2.	*Momordica charantia*		
	Leaf	9.134	0.915
	Seed	6.012	0.941
3.	Leaf mix	13.950	0.656
4.	Seed mix	12.825	2.861
SEd		0.032	0.008
CD (0.05)		0.069	0.017

The values are mean of triplicates

The protein content was found to be in higher concentration in both leaf and seed extract of *Syzygium cumini* whereas Carbohydrate was found to be highly concentrated only in the seed extract. The least value of protein was observed in the seed extract of *Momordica charantia* and Carbohydrate in the leaf extract of *Syzygium cumini.* The protein content of *Syzygium cumini* was found to be greater than *Momordica charantia.*

FIGURE - 4

PROTEIN AND CARBOHYDRATE CONTENT OF THE PLANT SAMPLES



A - *S. cumini* leaf   B - *S. cumini* seed   C - M. *charantia* leaf   D - M. *charantia* seed

E - Leaf mix   F - Seed mix

4.3 Free Radical Scavenging Effect of the Plant Samples

The extent of inhibition of *in vitro* lipid peroxidation, superoxide generation and nitric oxide generation by the plant samples is shown in Table V and Figure 5.

TABLE V

EFFECT OF PLANT SAMPLES ON INHIBITION OF *IN VITRO* LIPID PEROXIDATION, SUPEROXIDE AND NITRIC OXIDE GENERATION

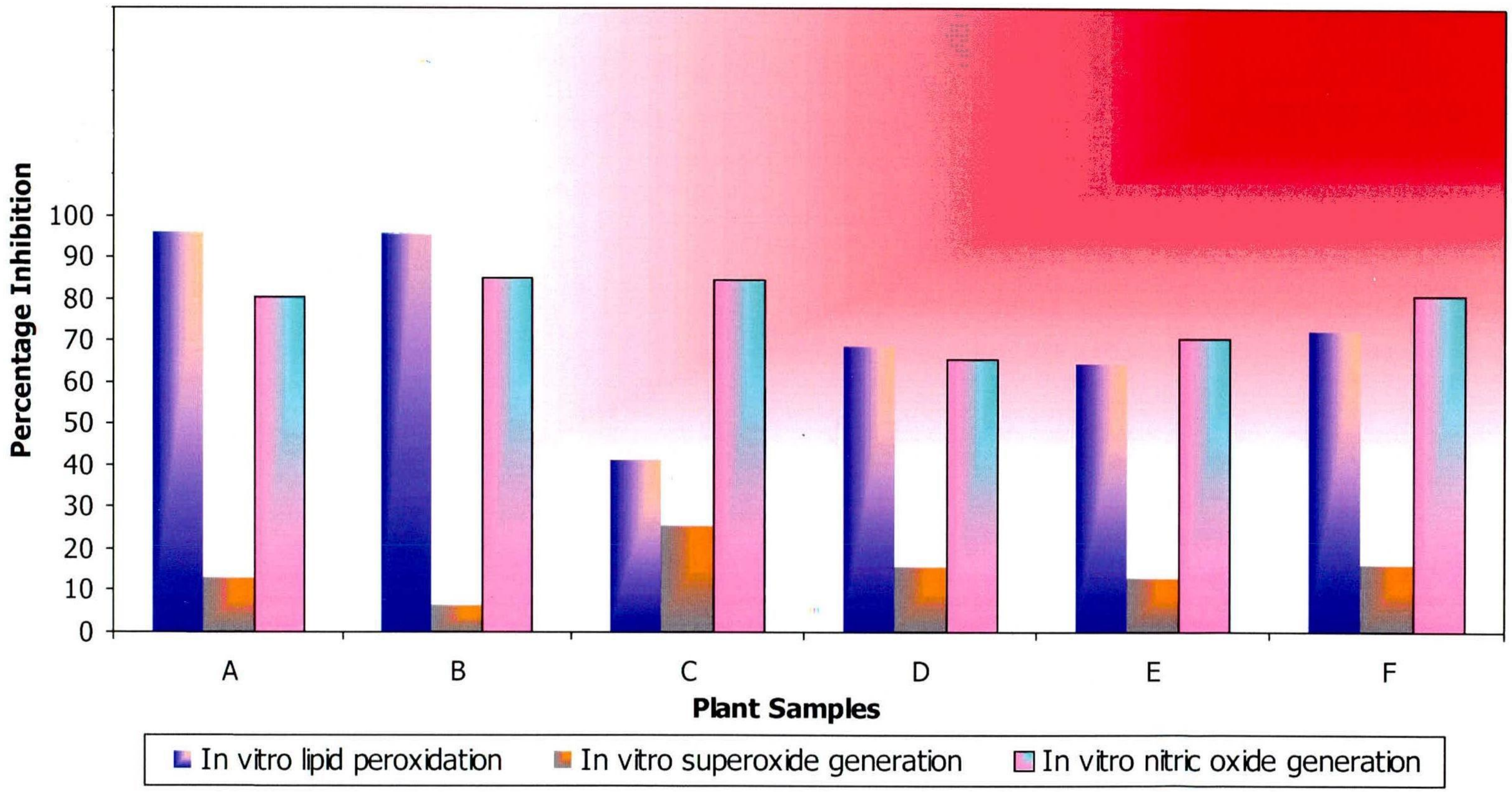
S.No	Plant Screened	*In vitro* Lipid peroxidation	*In vitro* Superoxide generation	*In vitro* Nitric oxide generation
1.	*Syzygium cumini*			
	Leaf	96.326	13.108	80.171
	Seed	97.690	6.616	84.872
2.	*Momordica charantia*			
	Leaf	41.384	25.484	84.650
	Seed	68.854	15.816	65.412
3.	Leaf mix	64.423	13.118	70.718
4	Seed mix	72.415	16.144	80.835
SEd		2.081	2.718	0.960
CD (0.05)		4.533	5.923	2.091

The values are mean of triplicates

The high level inhibitory effect of lipid peroxidation and nitric oxide generation *in vitro* was observed in the seed extract of *Syzygium cumini* (97.69% and 84.872%) and their minimum inhibitory level was found in the leaf and seed extract of *Momordica charantia* (41.384% and 65.412%). The leaf extract of *Momordica charantia* showed maximum inhibition of superoxide generation and the seed extract of *Syzygium cumini* exhibits minimum inhibition (6.616%).

FIGURE - 5

PERCENTAGE INHIBITION OF *IN VITRO* LIPID PEROXIDATION, SUPEROXIDE AND NITRIC OXIDE GENERATION



A - *S. cumini* leaf **B - *S. cumini* seed** **C - M. *charantia* leaf** **D - M. *charantia* seed**

E - Leaf mix **F - Seed mix**

Khopde *et al.*, (2001) showed that amla extract inhibits radiation induced lipid peroxidation in Microsomes. Amla extract may scavenge the free radicals responsible for inhibiting LPO.

It is evident from Table V that *Syzygium cumini* is an effective scavenger for lipid peroxide and nitric oxide whereas *Momordica charantia* had potent Superoxide scavenging effect.

4.4 Antimicrobial Activity of the Alcoholic Extracts of the Plant Samples against Bacterial Isolates

The antimicrobial activity of the plant extracts was determined by agar disc diffusion assay and the bacterial isolates were used to screen the antimicrobial activity of alcoholic extracts of plant samples *Syzygium cumini* and *Momordica charantia.*

4.4.1 Screening of antibacterial activity by agar disc diffusion method

Antibiotic Sensitivity Test

Table VI , Figure 6 and Plate 3 represent the sensitivity levels of the microorganisms against standard antibiotics in terms of growth inhibition zone.

TABLE VI

ANTIBIOTIC SENSITIVITY TEST

S.No	Microorganisms	Zone of Inhibition (mm)						
		E	C	S	A	T	G	N
1.	*Escherichia coli*	5.7	3	1.2	8	4.5	2.3	4
2.	*Bacillus subtilis*	12	9.5	10	3.5	2	3.3	3
3.	*Pseudomonas aeruginosa*	2.3	1.5	5.8	0.7	3.7	4.7	NZ

The values are mean of triplicates

NZ-No Zone E-Erythromycin, C-Chloramphenicol, S-Streptomycin, A-Ampicilin, T-Tetracycline, G-Gentamycin, N-Nystatin

FIGURE - 6

ANTIBIOTIC SENSITIVITY TEST

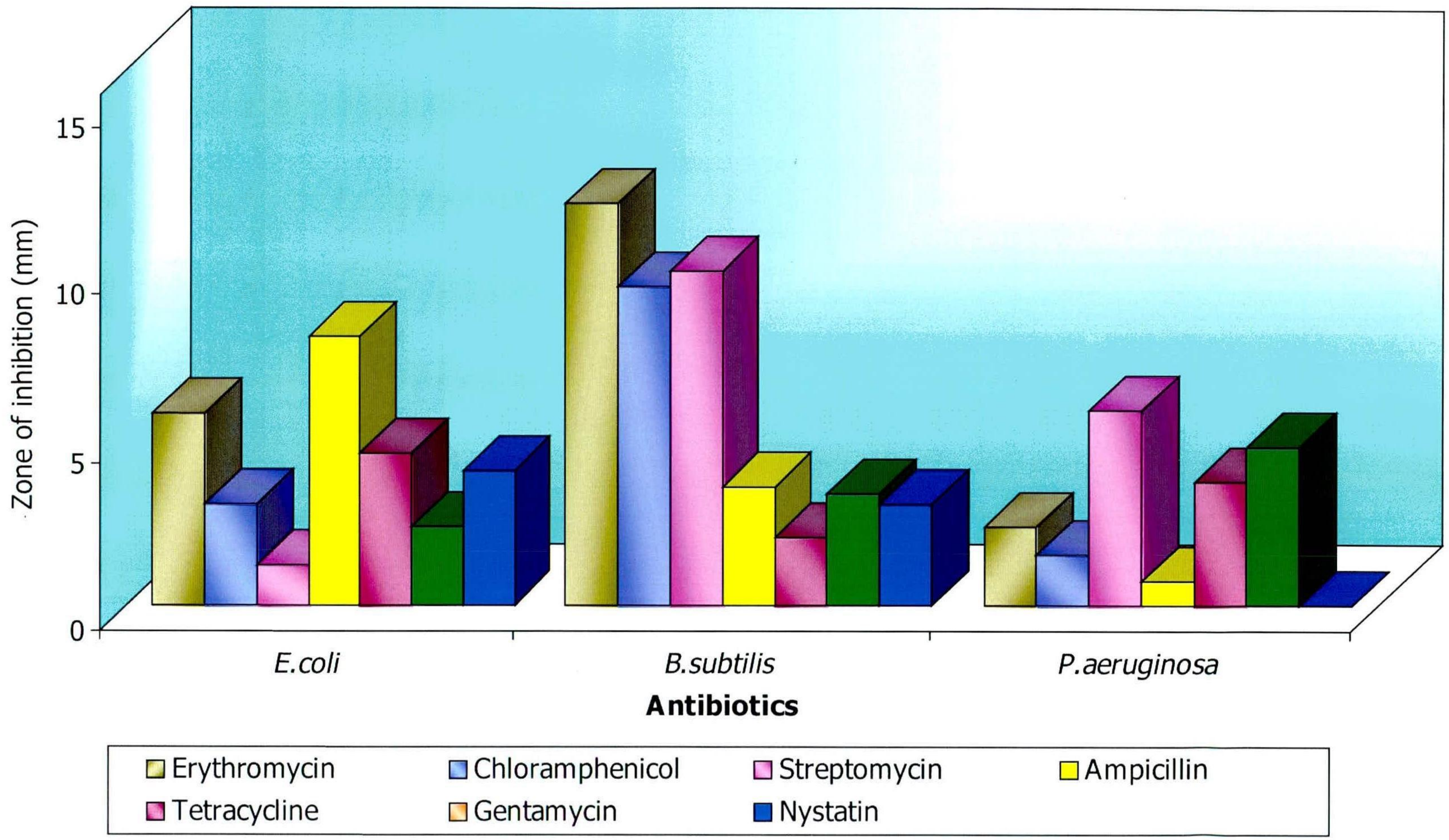
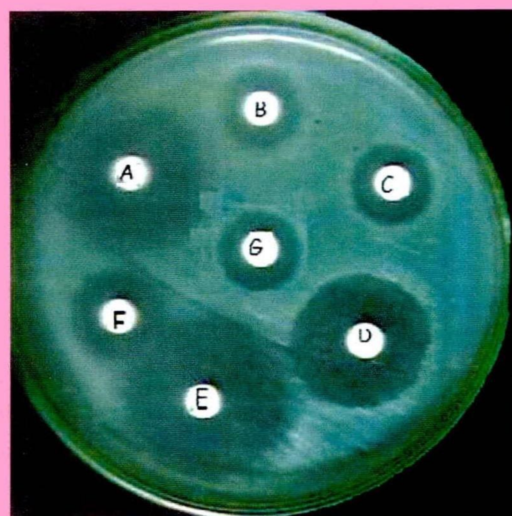
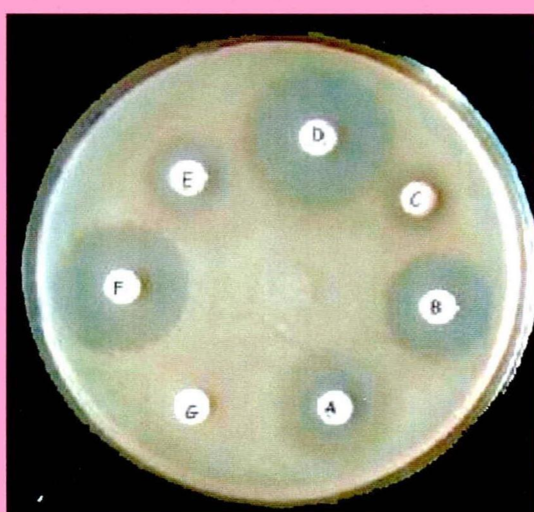


PLATE 3
ANTIBIOTIC SENSITIVITY TEST

Escherichia coli



Bacillus subtilis



Pseudomonas aeruginosa

A - Chloroamphenicol
B - Tetracycline
C - Ampicillin
D - Steptomycin
E - Erythromycin
F - Gentamycin
G - Nystatin

From Table VI and Figure 6 it is observed that *Bacillus subtilis* was more susceptible to Erythromycin, Chloramphenicol and Streptomycin (12mm, 9.5mm and 10mm zone of inhibition respectively) and the least sensitive was *Pseudomonas aeruginosa* to erythromycin (2.3mm) and chloramphenicol (1.5mm) and *Escherichia coli* to streptomycin (1.2mm).

Ampicilin and Tetracycline inhibited the growth of *E.coli* to the maximum extent (8mm and 4.5mm) whereas *Pseudomonas aeruginosa* has minimum inhibition towards ampicilin (0.7mm) and *Bacillus subtilis* to tetracycline.

Gentamycin is more effective against *Pseudomonas aeruginosa* (4.7mm) and least effective against *E.coli* (2.3mm). The antibiotic Nystatin controls the growth of *E.coli* at the maximum (4mm) followed by *Bacillus subtilis* (3mm), *Pseudomonas aeruginosa* showed no zone of inhibition revealing that Nystatin is ineffective against *Pseudomonas aeruginosa*.

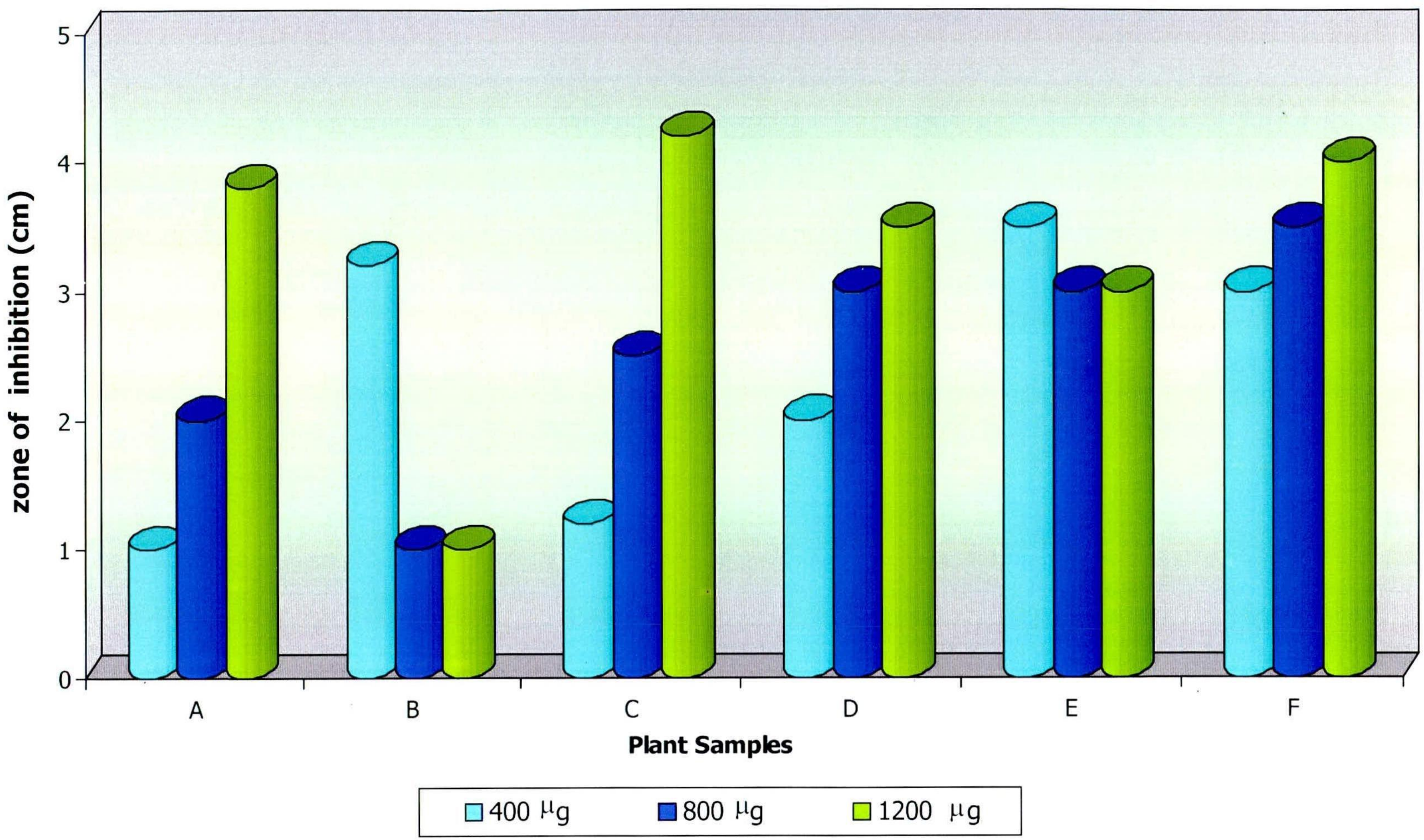
Table VII and Figure 7 represent the antibacterial activity of alcoholic extract of the plant samples against *Escherichia coli*

TABLE VII

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF THE PLANT SAMPLES AGAINST *Escherichia coli*

S.No	Plants Screened	Zone of Inhibition (cm) Concentration of Extract (μg/ml)		
		400μg	800μg	1200μg
1.	*Syzygium cumini*			
	Leaf	1.0	2.0	3.8
	Seed	3.2	1.0	1.0
2.	*Momordica charantia*			
	Leaf	1.2	2.5	4.2
	Seed	2.0	3.0	3.5
3.	Leaf mix	3.5	3.0	3.0
4	Seed mix	3.0	3.5	4.0

FIGURE 7
ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF PLANT SAMPLES AGAINST *Escherichia coli*



A - *S. cumini* leaf **B - *S. cumini* seed** **C - M. *charantia* leaf** **D - M. *charantia* seed**
E - Leaf mix **F - Seed mix**

It is evident from Table VII that all the extracts exhibited zone of inhibition against *Escherichia coli* at various concentrations (400µg, 800µg and 1200µg). Comparison among various extracts revealed that leaf mixture showed maximum zone of inhibition against *Escherichia coli* at 400 µg and the seed mixture at 800µg. But at high concentration (1200µg), the leaf extract of *Momordica charantia* exhibited maximum zone of inhibition. The zone of inhibition increases with increase in concentration of all the extracts except seed extract of *Syzygium cumini* and leaf mixture extract. The leaf extract of *Momordica charantia* inhibited bacterial growth to a greater extent than the leaf extract of *Syzygium cumini.*

The results of Janovska *et al.* (2003) showed that the extracts from *Sanguisorba officinalis*, *Turilago farfare*, *Chelidonium majus*, *Tribulus terrestris* and *Schisandra chinensis* possessed antimicrobial activity against *Bacillus cereus*, *Escherichia coli* and *Staphylococcus aureus*.

The ethanolic, methanolic and chloroform extracts of *Nerium oleander* (Apocynaceae) leaf and root showed considerable antimicrobial activity against *Bacillus pumillus, Bacillus subtilis, Staphylococcus aureus* and *Escherichia coli* (Shariff *et al.*, 2006).

The antibacterial activity of the alcoholic extract of the plant samples against *Bacillus subtilis* is given in Table VIII and Figure 8.

TABLE VIII

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF THE PLANT SAMPLES AGAINST *Bacillus subtilis*

S.No	Plants Screened	Zone of Inhibition (cm)		
		Concentration of Extract (µg/ml)		
		400µg	800µg	1200µg
1.	*Syzygium cumini*			
	Leaf	2.0	3.0	3.5
	Seed	1.7	3.0	3.0
2.	*Momordica charantia*			
	Leaf	3.4	3.4	2.8
	Seed	3.7	1.8	3.5
3.	Leaf mix	0.8	3.5	2.3
4.	Seed mix	2.5	2.0	2.0

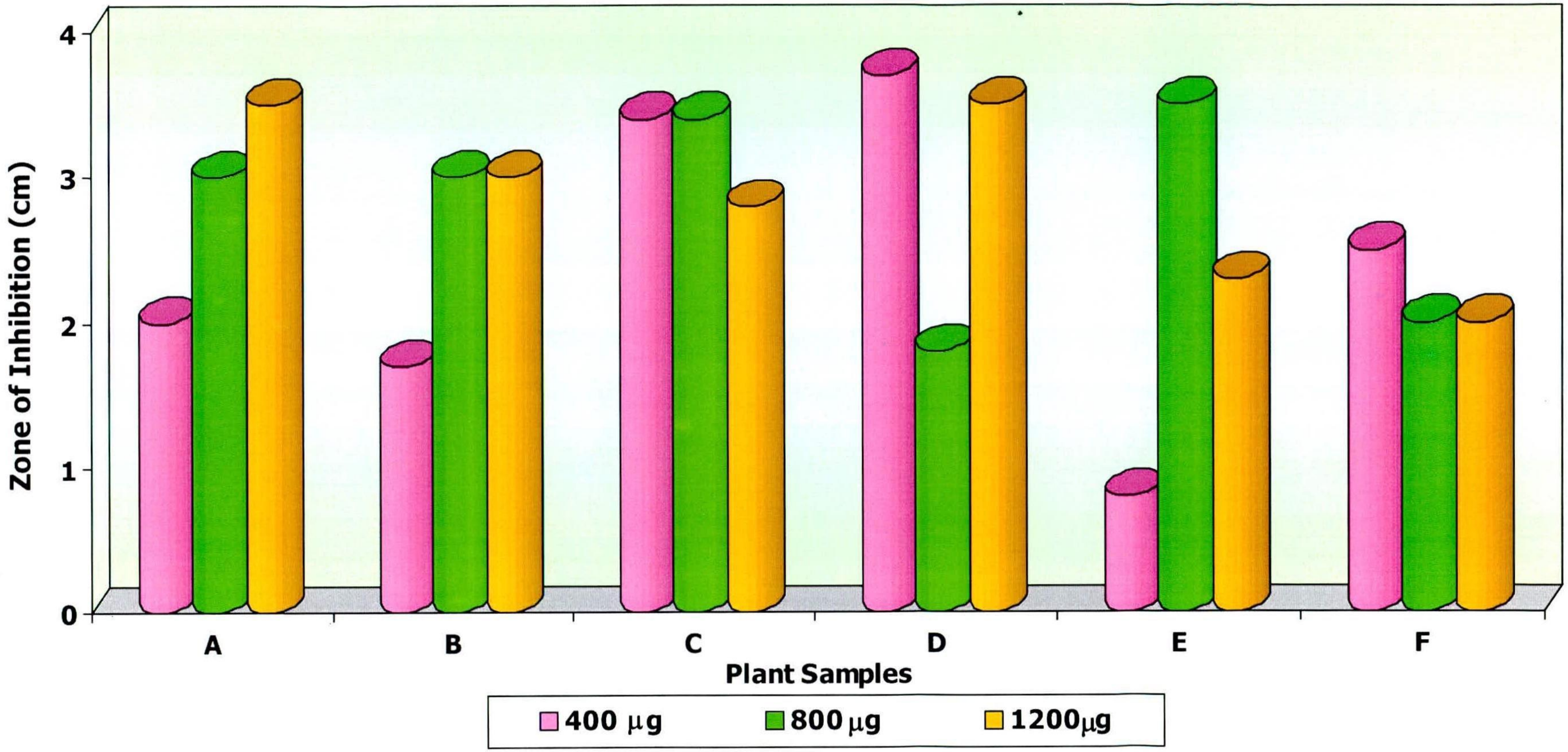
The zone of inhibition was found to be maximum for *Momordica charantia* seed extract at 400µg and the leaf mixture caused highest inhibition at 800µg against *Bacillus subtilis*. At high concentration of 1200µg both *Syzygium cumini* leaf and *Momordica charantia* seed extract recorded the same value for zone of inhibition and the inhibition was also found to be the maximum.

Thaakur (2006) has shown significant effect of *Adhatoda vasica* leaf extract against *Bacillus subtilis* and suggests that the leaf can be used for wound healing and can also be used for septicaemia (Thaakur, 2006).

Rao *et al.* (2005) have indicated that the alcoholic extract of bark and leaf of *Xylocarpus grantum* were found to be having significant antimicrobial activity against *Bacillus subtilis, Bacillus pumilus*, *Staphylococcus aureus* and *Escherichia coli.*

FIGURE 8

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF THE PLANT SAMPLES AGAINST *Bacillus subtilis*



A - *S. cumini* leaf B - *S. cumini* seed C - M. *charantia* leaf D - M. *charantia* seed
E - Leaf mix F - Seed mix

Table IX and Figure 9 indicates the antibacterial activity of alcoholic extract of the plant samples against *Pseudomonas aeruginosa*

TABLE IX

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF THE PLANT SAMPLES AGAINST *Pseudomonas aeruginosa*

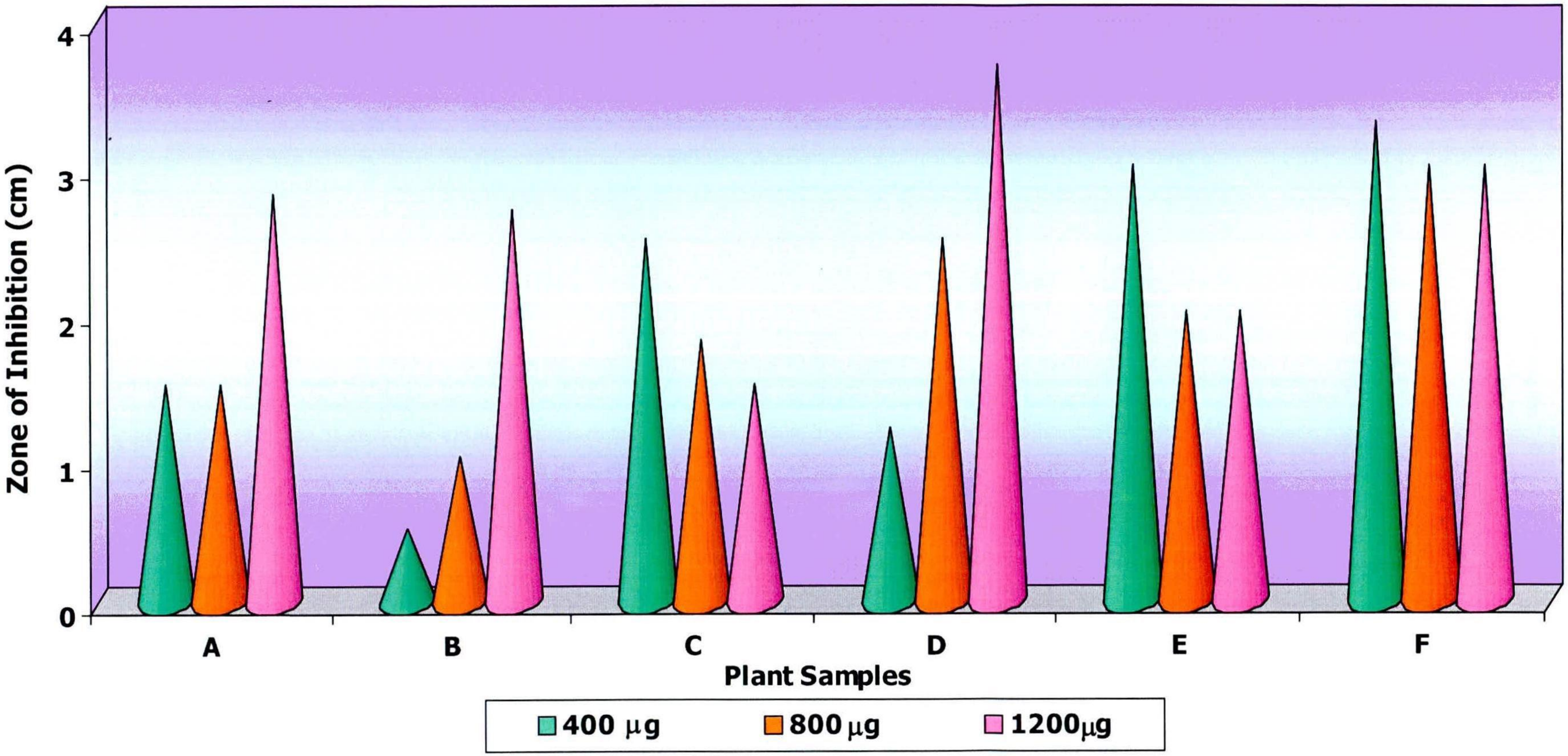
S.No	Plants Screened	Zone of Inhibition (cm)		
		Concentration of Extract (μg/ml)		
		400μg	800μg	1200μg
1.	*Syzygium cumini*			
	Leaf	1.5	1.5	2.8
	Seed	0.5	1.0	2.7
2.	*Momordica charantia*			
	Leaf	2.5	1.8	1.5
	Seed	1.2	2.5	3.7
3.	Leaf mix	3.0	2.0	2.0
4.	Seed mix	3.3	3.0	3.0

It is seen from Table IX that the seed mixture inhibited the growth of *Pseudomonas aeruginosa* to a greater extent at a concentration of 400μg and 800μg *Momordica charantia* seed extract at 1200μg when compared to other extracts. *Syzygium cumini* seed extract showed the least value for zone of inhibition at concentrations 400μg and 800μg. At higher concentration (1200μg) *Momordica charantia* leaf extract recorded the lowest inhibition. Considerable antimicrobial activity of the leaf and seed mixture extract was observed against *Pseudomonas aeurginosa* only at lower concentration (400μg) and the activity was lesser at concentration at 800μg and 1200μg. The value for zone of inhibition at 800 μg and 1200 μg remains the same.

Prabhu *et al.* (2008) showed that the aqueous extract of *Trianthema decandra* possess bactericidal action against *Staphylococcus aureus*, *Pseudomonas aeruginosa.*

FIGURE 9

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF THE PLANT SAMPLES AGAINST *Pseudomonas aeruginosa*

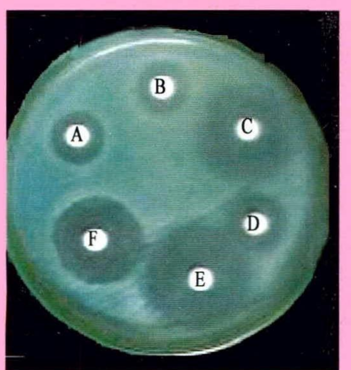


A - *S. cumini* leaf B - *S. cumini* seed C - M. *charantia* leaf D - M. *charantia* seed

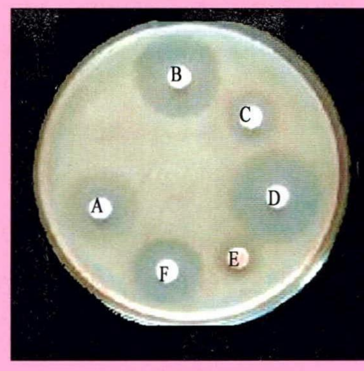
E - Leaf mix F - Seed mix

PLATE - 4

ANTIBACTERIAL ACTIVITY OF ALCOHOLIC EXTRACT OF PLANT SAMPLES AGAINST *Escherichia coli, Bacillus subtilis* and *Pseudomonas aeruginosa*



400µg



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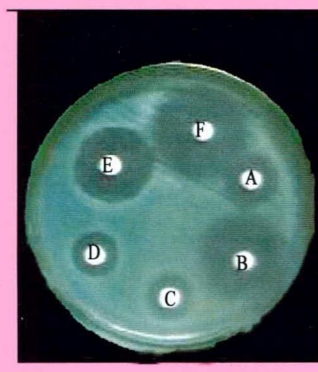

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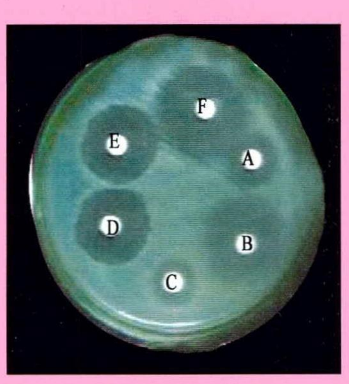

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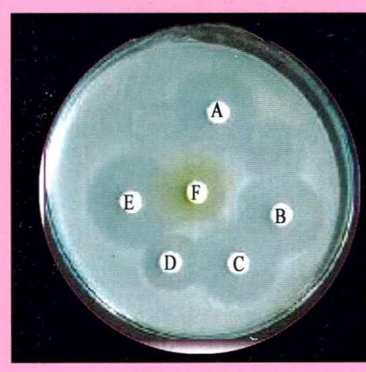

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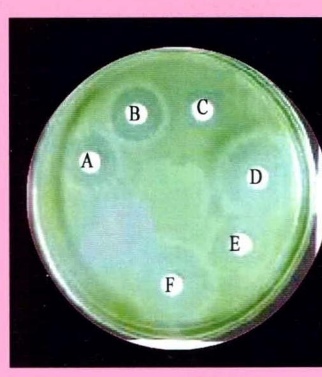

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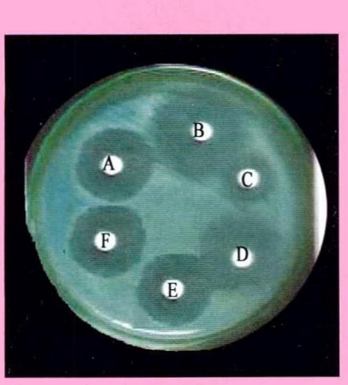
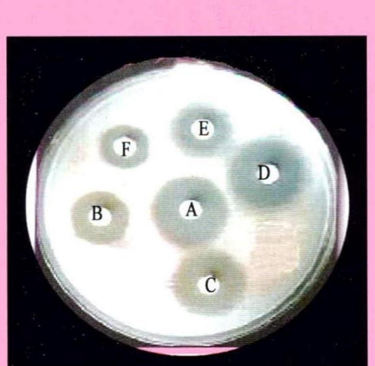
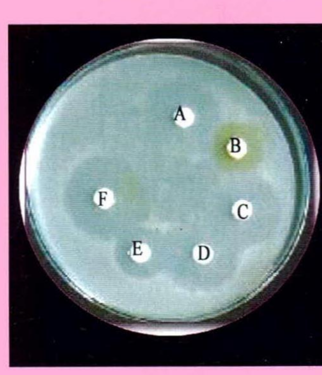


1200µg



1200µg



1200µg

A - *Syzygium cumini* leaf

B - *Momordica charantia* leaf

C - *Syzygium cumini* seed

D - *Momordica charantia* seed

E - Leaf Mix

F - Seed Mix

Manikandan *et al.*, (2006) showed that the chloroform extract of *Aristolochia bracteate* Retz exhibited significant antibacterial activity against *Streptococcus faecalis*, *Lactobacillus plantarum*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Bacillus subtilis*.

4.5. Antidiabetic Activity

The blood glucose levels of diabetic patients supplemented with the seed powder of *Syzygium cumini* and *Momordica charantia* is represented in Table X and XI respectively.

TABLE X

EFFECT OF SEED POWDER OF *Syzygium cumini* ON THE BLOOD GLUCOSE LEVELS OF DIABETIC PATIENTS

Age Range	Number of Subjects (n)	Mean Level of Glucose (mg/100ml)		t- Value
		Before supplementation	After supplementation	
40-50	7	155.1	131.4	2.287
50-60	7	174.7	165.1	2.909*
60-70	6	151.3	132.3	3.680*

*The values are statistically significant at $p<0.05$

TABLE XI

EFFECT OF SEED POWDER OF *Momordica charantia* ON THE BLOOD GLUCOSE LEVELS OF DIABETIC PATIENTS

Age Range	Number of Subjects (n)	Mean Level of Glucose (mg/100ml)		t- Value
		Before supplementation	After supplementation	
40-50	5	159.8	151.8	2.054
50-60	10	141.0	135.8	6.617*
60-70	5	143.6	135.6	4.276*

* The values are statistically significant at $p<0.05$

The Table X reveals that the level of blood glucose was found to be 155.142 mg/100ml in diabetic patients of age group (40-50), 174.710 mg/ml in the age group (50-60) and 151.330 mg/100ml in the age group (60-70) before supplementation. After supplementation of diabetic patients with the seed powder of *Syzygium cumini* for a period of 40 days, the blood glucose level was found to be decreased in all the three different age groups but the decrease was found to be statistically significant in diabetics who were in the age group of 50-60 and 60-70.

Similar trend was observed in the case of diabetics supplemented with seed powder of *Momordica charantia*. The findings suggest that seeds of *Syzygium cumini* and *Momordica charantia* possess a significant antidiabetic effect.

Saravanan and Pari, (2007) have indicated that *Syzygium cumini* bark possesses a significant beneficial effect on glycoproteins in addition to its antidiabetic action.

Kaleem *et al.* (2006) have reported that *Annona squamosa* leaf extract supplementation is useful in controlling the blood glucose and thus it is beneficial in preventing diabetic complications.

Cathranthus roseus leaf powder showed significant reduction in the level of blood glucose and improvement in the liver glycogen content (Meena and Pasupathy, 2006).

Nair *et al.* (2008) have shown that in diabetes induced rat fed with *Aloe vera*, the fasting plasma glucose levels were reduced to normal suggesting hypoglycemic activity of *Aloe vera*.