

EFFECT OF INGESTION OF CAFFEINE AND *DENNETTIA TRIPETALA* (PEPPER FRUIT) SEEDS ON PEAK EXPIRATORY FLOW RATE IN A NIGERIAN UNIVERSITY**Omigie M.I^{*}, Agoreyo F.O¹, Offiah C. M²**¹Department Of Physiology, School of Basic Medical Sciences, University of Benin, Benin City, Nigeria²Department Of Biochemistry, Faculty of Life Sciences, University OF Benin, Benin City, Nigeria

ABSTRACT: *Background: Caffeine is a known respiratory stimulant. Literatures abound on the medicinal use of Dennettia tripetala seeds but limited literatures of its effect on the airway post caffeine ingestion. This study is aimed at investigating the combined effect of ingestion of caffeine and Dennettia tripetala seeds on the airway using peak expiratory flow rate (PEFR) index. Study design: Thirty (30) undergraduates' students of University of Benin comprising of 15 males and 15 females with age range of 18-25 years, were used for this study. Each Subject was given 2g of caffeine and their PEFR recorded at 30 minutes intervals post ingestion, and subsequently 2g of Dennettia tripetala seeds were given, 2hours post ingestion of Caffeine. PEFR was also recorded for subjects who ingested 2g of Dennettia tripetala seeds 10 minutes post ingestion. Subjects' pre administration PEFR was also recorded. All measurements were taken using the Mini Wright peak flow meter. Results: Results showed that PEFR was significantly increased ($p < 0.05$) when 2g of caffeine, 2g of pepper fruit seeds were ingested and a much higher increase was observed when 2g of pepper fruit seeds was administered 2hours post ingestion of Caffeine when compared to the control. These increases in PEFR were much more observed in males than in the females' subjects. Conclusion: This suggests that Dennettia tripetala seeds have bronchodilatory effect and when taken together with Caffeine may be of supportive treatment for the treatment of obstructive or restrictive airway diseases.*

KEYWORDS: Caffeine, PEFR, Dennettia tripetala seeds.

INTRODUCTION

Peak expiratory flow rate (PEFR) is the maximum rate at which air can be expired after a deep inspiration (Sembuligam and Sembuligam, 2010) and it's useful in the differentiating between obstructive and restrictive pulmonary diseases. A variety of fruits and vegetables are consumed in Nigeria on a daily basis, and they form an integral part of our diet but most times only the fleshy pulps of these fruits are consumed leaving the seeds. *Dennettia tripetala* (pepper fruit) belongs to the Annonaceae family (Etukudo 2000) . The leaves and the seeds are used in folk medicine for the treatment of fever, cough, asthma, catarrh, diarrhea and rheumatism (Burkill 1985). *Dennettia tripetala* is commonly known as "pepper fruit" by the English, "mmimi" by the Igbos, "Nkaika" by the Ibibio and Efik, "Imako" by the Urhobo tribe of the Niger-Delta region, and "Igbere" by the Yorubas, Little is known of the composition of *Dennettia tripetala* seeds despite its widespread multipurpose uses as food and drugs. Nwaogu et al. (2007) investigated phytochemical content of *Dennettia tripetala* and detected the presence of saponins, flavonoids, tannins and cyanogenic glycosides.

Ihemeje et al (2013) reported the presence of flavonoids in *Dennettia tripetala*. The rich presence of a type of essential oil called oleoresins determines the aromatic flavoring, coloring and pungent properties of pepper fruits. *Dennettia tripetala* seeds have also been reported by Johnson et al., (2012) to possess antiviral, anti-allergic, antiplatelet, anti-inflammatory, anti-tumor and antioxidant activities Johnson et al., (2012). Caffeine (1, 3, 7 - trimethylxanthine) is a natural alkaloid present in the leaves, fruits and seeds of various plants (coffee, kola, tea, mate, etc); yet it can also be artificially synthesized in the laboratory. Coffee is the primary source of caffeine intake, providing approximately 210 mg/d per person in the United States. Health benefit of caffeine, include reduced risk of developing Parkinson disease, type II diabetes, hepatic diseases and cardiovascular disease Iyawe et al., (1990). Other effect has been linked to be a mild stimulant of the central nervous system, cardiac muscle, relaxes bronchial smooth muscle, increases gastric secretion as well as produces diuresis (Endsall and Means 1914). Caffeine has also been reported to be a respiratory stimulant (William et al.,2005), being a monoamine oxidase inhibitor (MAO) can pass through the blood brain barrier to affect the central nervous system function directly including the respiratory centers. Extensive studies have been done on the effect of caffeine on PEFR but little or none has been done on the *Dennettia tripetala* on PEFR. This study is aimed at evaluating the effect of caffeine and *Dennettia tripetala* on PEFR at various intervals.

MATERIALS AND METHODS

This entire work was carried out in physiology laboratory, university of Benin, Benin City, for a period of one month. A total of thirty (30) undergraduate Uniben students were used for this study comprising of 15 males and 15 females within the age range of 18-25 years, which were non-smokers, non-habitual users of caffeine as well as no history of any cardiopulmonary diseases obtained from self reported health history and life style questionnaire.

All measurements comprising of anthropometric, physiologic and pharmacology were taken and recorded and Ethical Committee approval also obtained. Pepper fruit was obtained from New Benin, a local market in Benin City, Edo State. The flesh was removed and the seeds collected, washed, sun-dried for some days until they got brittle. The dried seeds were then weighed in the measuring scale, to obtain the required weight needed for the study.

Nescafe instant coffee made in Cote D'Voire was used since pure caffeine was not easily available; each sachet containing 2g of caffeine was dissolved with 200ml of warm water and administered to the subject. Measurements of their PEFR were taken at 20minutes intervals and at 2hours post ingestion of caffeine, 2g of pepper fruit seeds was given to the subjects to chew and their PEFR recorded 10 minutes post ingestion. A week later another 2g of pepper fruit seeds was given to each subject and their PEFR also recorded 10minutes post ingestion.

All tests were performed with the subjects comfortably seated, with their pre (control) and post ingestion PEFR measurements taken using a calibrated Mini Wright's peak flow meter (W 27871).

Statistical Analysis

Data were presented as means \pm S.E.M and analyzed by one way ANOVA according to the method of Snedecor and Cochran (1980). A p- value ($p < 0.05$) was considered significant.

RESULTS

All results are presented as mean \pm standard error of mean.

PARAMETER	MALE (Mean \pm S.E M)	FEMALE (Mean \pm S.E M)	P-value
Age (years)	23.20 \pm 0.56	21.27 \pm 0.50	P < 0.05
Chest Circumference (cm)	89.00 \pm 1.21	88.60 \pm 1.72	P > 0.05
Height (cm)	172.80 \pm 1.47	159.80 \pm 1.04	P < 0.05
Weight (Kg)	64.27 \pm 1.82	56.00 \pm 1.39	P < 0.05
BMI	21.64 \pm 0.53	21.97 \pm 0.60	P > 0.05

Table 1: Comparing the mean values of anthropometric parameters in male and female young adults.

PARAMETER		Basal	Caffeine (2g) after 20mins	Pepper fruit seeds (2g) 2Hrs later	p-value
PEFR (L/min)	Male	546.00 \pm 15.94	570.67 \pm 14.26*	603.33 \pm 13.58*	P < 0.05
	Female	444.00 \pm 14.07	462.00 \pm 14.22*	488.67 \pm 14.47*	P < 0.05

Table 2: Comparing the mean values of PEFR of young male and female adults before and after the ingestion of caffeine and pepper fruit seeds.

*P < 0.05 indicates significant difference when basal was compared with post ingestion values of both caffeine and pepper fruit seeds.

PARAMETER		Basal	Pepper fruit seeds 10mins	p-value
PEFR (L/min)	Male	546.02 \pm 15.94	608.43 \pm 13.64*	P < 0.05
	Female	444.00 \pm 14.07	490.68 \pm 14.67*	P < 0.05

Table 3: Comparing the mean values of PEFR young male and female adults 10 mins after the ingestion of pepper fruits seeds one week after the first administration.

*P< 0.05 indicates significant difference when basal was compared with pepper fruit seeds

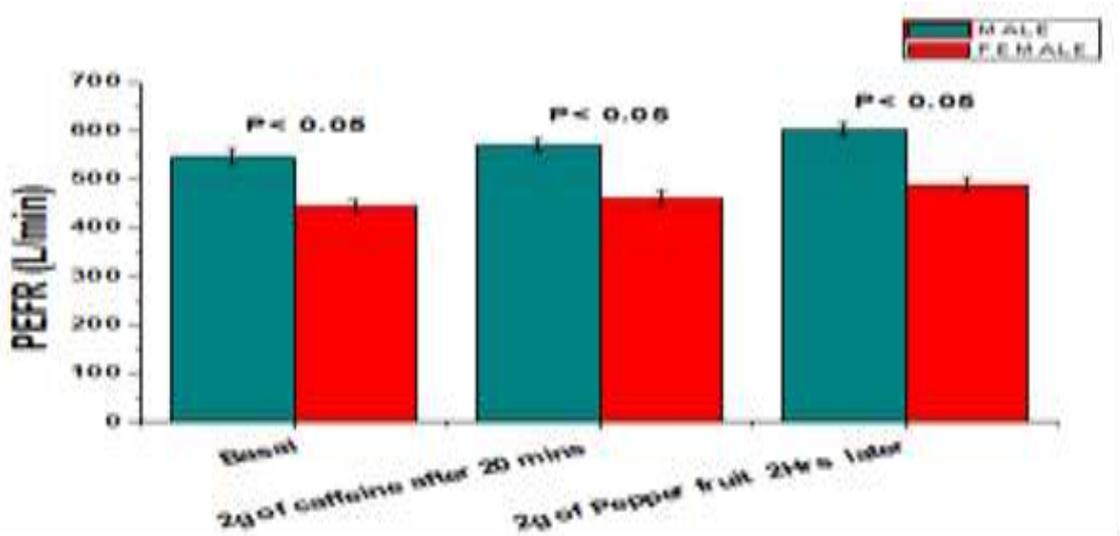


FIG.1: The effect of ingestion of caffeine and pepper fruit seeds on the peak expiratory flow rate. The graph shows PEFR at 0mins (which represents the control), 20mins post ingestion of (2g) caffeine and 2 hours post ingestion of (2g) pepper fruit seeds for both males and females respectively.

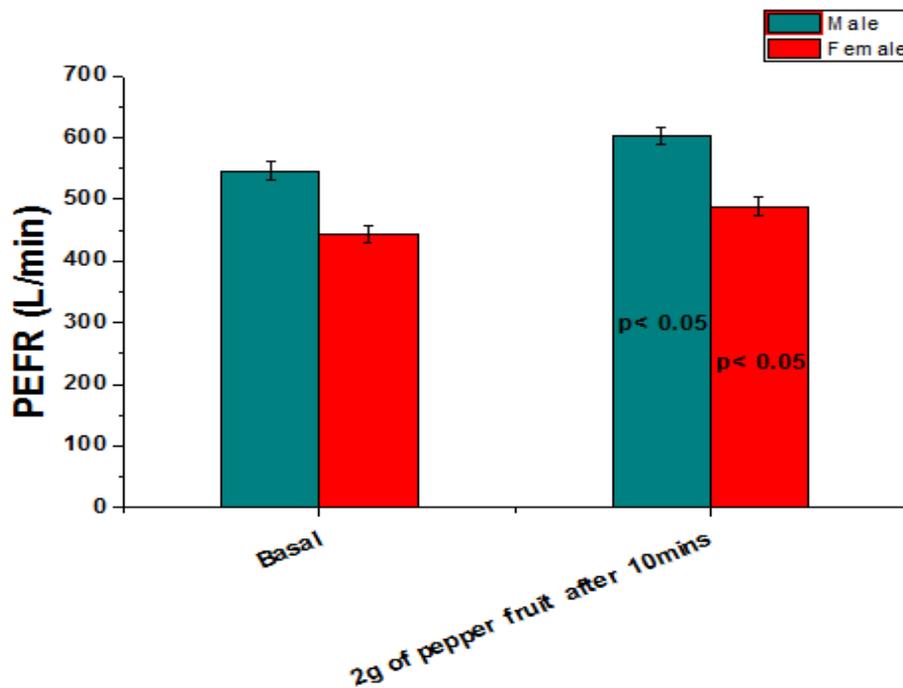


FIG. 2: The effect of ingestion of pepper fruit seeds on the peak expiratory flow rate male and female Subjects. The graph shows PEFR at 0mins (which represents the control) and at 10mins post ingestion of pepper fruit seeds.

DISCUSSION

Caffeine is a known respiratory stimulant as seen in the increase in PEFR ($p < 0.05$) when 2g of caffeine was administered compared to the control. A similar increase in PEFR ($p < 0.05$) was also observed when 2g of pepper fruit was ingested. There was however a much higher increase in PEFR when 2g of pepper fruit seeds was administered 2 hours post ingestion of caffeine, as caffeine has been reported to moderately improve airway function 2-4 hours post ingestion (Daly et al., 1993). These increases in PEFR were much more observed in males than in the female subjects. Nwaogu et al., (2007) investigated the Phytochemical constituent of the seeds and found the presence of tannins, saponins, phenols, flavonoids and cyanogenic glycosides. Flavonoids are cytoprotective compounds and have been positively associated with forced expiratory volume in one second and PEFR increment in patients with COPD and in the prevention of the progression of pulmonary emphysema in animal models (Tabak et al., 2001). Flavonoids also possess anti-asthmatic activity by inhibiting platelet-activating factor (PAF), phospholipase A2 (PLA2) and phosphodiesterase (PDE) (Miller, 2001).

This research work has shown that *Dennettia tripetala* seeds have bronchodilator effect and when taken together with Caffeine may be used as supportive treatment of obstructive or restrictive airway disease.

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