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ESTIMATION OF NICOTINE CONTENT IN COMMERCIAL BRANDS OF BIDIS AND CIGARETTES BY NON-AQUEOUS TITRATION

Dr. Vrunda V. Shah[1*], Hitaishi Panchal[1], Shraddha Patel[1], Reema Agarwal[1], Dr. Vipul K. Shah[2] and Dr. M. M. Patel[1]

[1]Shree Swaminarayan Sanskar Pharmacy College, Zundal, Gandhinagar-382421, Gujarat, India.

[2]Troikaa Pharmaceuticals Ltd., Ahmedabad, Gujarat, India.

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***Corresponding Author**
Dr. Vrunda V. Shah
Shree Swaminarayan Sanskar Pharmacy College, Zundal, Gandhinagar-382421, Gujarat, India.

ABSTRACT

The main objective of this experiment is to determine the amount of nicotine in commercial brand bidis and cigarettes by means of a non-aqueous acid-base titration. This study focus on harmful level of nicotine present in bidis and cigarettes by comparative study of titration analysis with marketed tobacco powder.Nicotine is weak base so treatment with alkali strengthens it for acid-base reaction. Due to alkaloid in nature, nicotine was extracted out by highly organic solvent like toluene or diethyl ether etc. The liberated nicotine was titrated with perchloric acid using crystal violet indicator. Result shows that Marketed Tobacco powder and local bidis had more concentration of nicotine as compare to branded cigarettes.

KEYWORDS: Nicotine, tobacco, acid-base titration, cigarette.

INTRODUCTION

The reported methods for estimation of nicotine suffer from such draw backs as high cost, multiple steps and also several clean-up steps (HPLC). They are time consuming and often poorly reproducible, some require toxic organic solvents. Any method chosen for routine analysis should be reasonably simple, used materials should be readily available in the laboratory or readily obtainable and require a minimum amount of equipment. These objectives have been fulfilled by titrimetric Procedure.

Non-aqueous titrations are those in which the titrations of too weakly acidic or basic substances are carried out using non-aqueous solvents so as to get sharp end point. Such

titrations can also be used for the titration of the substances not soluble in water. The speed, precision and accuracy of the non-aqueous method are close to those of classical acidimetric and alkalimetric titrations. The apparatus involved are also same but moisture and carbon dioxide are to be avoided in non-aqueous methods because water, which is a weak base, can compete with the weak nitrogen base and the end point would not be sharp at all. It has been observed through experiments that the moisture content in non-aqueous titrations should not be more than 0.05%.[1]

When a weakly basic drug is present, water (OH^-) acts as stronger base as compared to the former one and preferentially accepts proton from an acid. Thus there is interference in the reaction of weak base with an acid. Similarly when a weakly acidic drug is present, water (H^+) behaves like a strong acid as compared to the former one and preferentially donates proton to the base. Thus there is interference in the reaction of weak acid with a base. Hence in the presence of water, titration of either weakly acidic substances with stronger base or weakly basic substances with stronger acid is not possible.[1]

Alkaloids are naturally occurring chemical compounds containing basic nitrogen atoms. The name derives from the word alkaline is due to nitrogen containing base. Alkaloids are produced by a large variety of organisms, including bacteria, fungi, plants, animals and are part of the group of natural products, also called secondary metabolites. Many alkaloids are purified from crude extracts by acid-base extraction. Many alkaloids are toxic to other organisms. They often have pharmacological effects and are used as medications, as recreational drugs, or in entheogenic rituals. Examples are the local anesthetic and stimulant cocaine, the stimulant caffeine, nicotine, the analgesic morphine, or the antimalarial drug quinine. Some alkaloids have a bitter taste.[2]

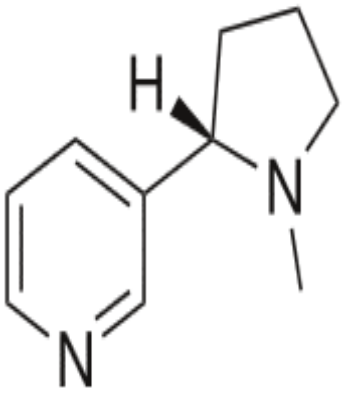

Fig. 1 Structure of Nicotine.

Nicotine is a pyridine alkaloid obtained from the dried leaves of tobacco plant *Nicotiana tobacum,* Family *Solanaceae*. Tobacco leaves contains 2 to 8% of nicotine combined as maleate or citrate.Nicotine is a colourless or pale yellow, very hygroscopic oily liquid with an unpleasant pungent odour and a sharp burning persistant taste. It gradually becomes brownish on exposure to air or light. Nicotine is soluble in water, alcohol, chloroform, ether, kerosene, petroleum ether and fixed oils.

Nicotine is a ganglionic cholinergic receptor agonist with complex pharmacological activities that includes effects mediated by binding receptors in autonomic ganglia, adrenal madula, the neuromuscular junction and the brain. Nicotine causes psychological and physical dependence during chronic uses.[3]

Cigarette smoking remains a leading cause of preventable disease and premature death in the India and other countries. On average 4,35,000 people in the India die prematurely from smoking-related diseases such as cancer, cardiovascular disease and pulmonary disease each year; overall, smoking causes 1 in 5 deaths. The chance that a lifelong smoker will die prematurely from a complication of smoking is approximately 50%. Cigarette smoking is a risk factor for respiratory tract and other infections, osteoporosis, reproductive disorders, adverse postoperative events and delayed wound healing, duodenal and gastric ulcers and diabetes.

Conditioning is a major factor that causes relapse to drug use after a period of cessation. It must be addressed as a component of counseling and behavioral therapy for drug addiction.[4]

PRINCIPLE[5]

- The principle involved in the determination of nicotine is non-aqueous titration where nicotine extract titrated with perchloric acid using crystal violet as an indicator.
- Perchloric acid solution is hyghroscopic in nature. Thus, if left open to air, concentrated perchloric acid dilutes itself by absorbing water from air. Hence it is not primary standard substance and need to be standardized.The standardization of perchloric acid using potassium hydrogen phthalate which is primary standard substance using crystal violet as an indicator.
- Perchloric acid acts as strong acid, whereas potassium hydrogen phthalate is weak acid. Therefore, perchloric acid will protonate KHP to form phthalic acid in other words though both are acids, KHP is more basic then perchloric acid.

- Nicotine is weak base so treatment with alkali strengthens it for acid-base reaction. Due to alkaloid in nature, nicotine was extracted out by highly organic solvent like toluene or diethyl ether etc. The liberated nicotine was titrated with perchloric acid using crystal violet indicator.

EXPERIMENTAL STUDY

Materials

Anhydrous Glacial acetic acid were obtained from RANKEM avantor performance materials india limited (Thane, maharastra); Perchloric acid (70%w/v), Toluene, Potassium hydrogen phthalate, Crystal violet indicator, acetic anhydride are obtained from CHEMDYES corporation (Rajkot, Gujarat); Branded Cigarettes (Bristol, Four square), Local bidis (Tesse chhap, Telephone chhap), Marketed tobacco powder were purchased from local market. All chemicals used through the study were of analytical grade reagents.

Methods

Preparation of 0.1 M Perchloric acid[5]

Mix 8.5 ml of perchloric acid with 500 ml of anhydrous glacial acetic acid and 25 ml of acetic anhydride, cool and add anhydrous glacial acetic acid to produce 1000 ml. Allow the prepared solution to stand for 1 day.

Preparation of Crystal violet indicator (0.1%w/v)[5]

Crystal violet indicator was prepared by dissolving an appropriate amount of powder in methanol.

Standardization of 0.1 M Perchloric acid[5]

Weigh accurately about 0.35g of potassium hydrogen phthalate, previously powdered and dried at 120℃ for 2 hours and dissolve it in 50 ml of anhydrous glacial acetic acid. Add 0.1 ml of crystal violet solution and titrate with perchloric acid solution until the violet colour changes to emerald green. Perform a blank determination and make any necessary correction.

General analytical procedure[6]

1) Into Erlenmeyer flask accurately weigh 6gm sample of tobacco (6-9 cigarettes without the paper and filter components). Record this data in your lab notebook as well as the brand name of the cigarettes.

2) To the flasks add approximately 50 ml of the saturated aqueous $Ba(OH)_2$ solution and 2 gm of granular $Ba(OH)_2$. Insure that the tobacco is thoroughly wetted. Into the flask, pipette 100.00ml of toluene, add a stirring bar, stopper the flask and magnetically stir for 20 minutes.
3) After 20 minutes filter most of the organic layer through a whatman filter paper into another clean dry erlenmeyer flask. The aqueous layer should not be poured into the filter.
4) Into a Clean, dry erlenmeyer flask pipette 20.00 ml of the filtered solution. Add 4-5 drops of crystal violet indicator. Using burrete filled with standardized 0.1M $HClO_4$ titrate to characterize greenish yellow endpoint. Repeat step 4 two more times for reproducibility.

Statistical analysis

Results are presented as the mean ± SD, using the Microcal TM Original TM Microcal Software, USA.

RESULTS AND DISCUSSION

Table: 1 shows the Analyzed Nicotine Contents (gm) and % Nicotine present in Marketed tobacco powder, local biddies and branded cigarettes.

Name of Product	Analyzed Nicotine Contents(gm)	%Nicotine contents (%w/w)
Marketed tobacco powder	0.0556	0.9082±0.00013
Telephone chhap (local bidi)	0.0788	1.31±0.0174
Tesse chhap (local bidi)	0.0672	1.1203±0.0161
Bristol (branded cigarette)	0.0469	0.7812±0.0124
Four square (branded cigarette)	0.0465	0.7751±0.027

Non-aqueous titrations are widely used in the Pharmacopoeias for the assay of many drug substances based on the properties of the drug which is either weakly acidic or weak bases. Here in the titrimetric method, we achieved a rapid determination of Nicotine not only in tobacco powder but also in its commercial products like bidis and cigarettes without any pre-extraction. All results were expressed as percentages, with representing the number of values. The titration was carried out for three replicates for the same sample during the same day for accuracy of results.

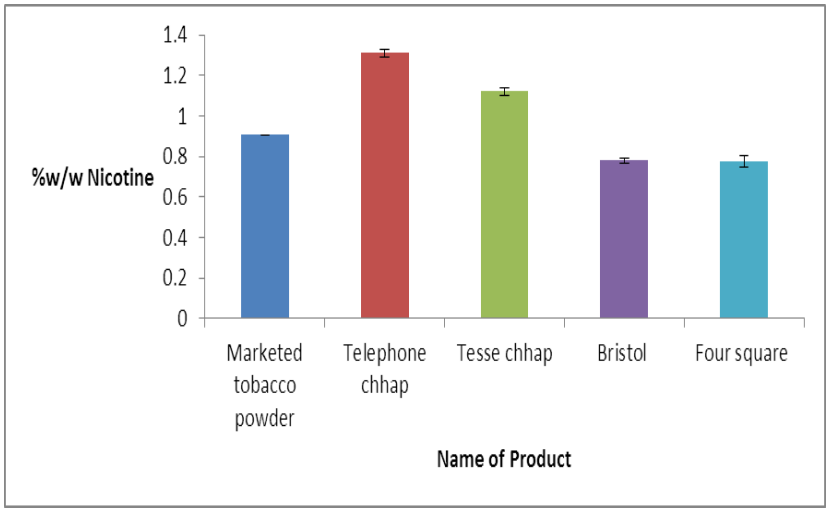

Fig 2: Graphical presentation of comparative study for estimation of Nicotine.

CONCLUSION

The proposed non-aqueous titration method is simple and costeffective for the determination of Nicotine content in tobacco powder and its commercial products. Nicotine products are hazardous to health and addiction creating agents. Results indicate that local bidis are more dangerous as it contains more nicotine as compare to branded cigarettes. These hazardous effects of local bidies can be minimized by inserting filter during the roll of bidies which allows less consumption of Nicotine in the body.

REFERENCES

1. Garratt DC, Quantitative analysis of drug; CBS Publishers and Distributors; Third edition, 2001; 792-802.
2. Kokate CK, Purohit AP, Gokhale SB, Textbook of Pharmacognosy; Nirali Prakashan, (1,2); Forty fifth edition, 3.1-3.8.
3. Rangari VD, Pharmacognosy & Phytochemistry; Career Publication: part-2; First edition, 329-331.
4. Benowitz MD, Neal L. Additional article information on nicotine addiction. The New England journal of medicine, June 17; 2010: 362(24): 2295-2303.
5. Raval HG, Baldania SL, Shah DA. Practicals in inorganic and analytical chemistry; Nirav and Roopal Prakashan; first edition, 134-136.
6. Siddiqui AA, Siddiqui SA. Natural Product Chemistry Practical Manual; CBS Publishers and Distributors; First Edition, 2008; 92.