Studies on the xanthines in Guarana

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INTRODUCTION

Guarana is a preparation formed from the pulped seeds of *Paullinia cupana* HBK var. *sorbilis* (Mart.) Ducke (*Sapindaceæ*). It is a traditional product made by the Sater-Mawe Amerindians of the Northwest Amazon who form the pulp into cylinders which are then dried in the sun or over a fire (HENMAN, 1982). The hard sticks so formed are used to prepare a refreshing drink by scraping of some of the material and heating it in water. In recent years guarana has been vigorously marketed in the UK as an "energy-boosting" food supplement.

Guarana was investigated in the nineteenth century and a substance named guaranine was isolated from it which was subsequently shown to be caffeine (BERTHEMOT and DECHASTELUS, 1840). However one of the distributors of guarana claims that guaranine is a tetramethylxanthine and not the same as the trimethylxanthine caffeine, the latter being formed from guaranine by harsh treatment of guarana during preparation but not when the drying is done in the sun. There is also conjecture that the presence of other compounds in the seeds, particularly saponins, affect the bioavailability of caffeine.

EXPERIMENTAL

A sample of sun-dried guarana claimed to contain guaranine was extracted with cold solvent and the xanthines present isolated and examined by TLC, HPLC, mass spectrometry and ^{1}H and ^{13}C NMR.

Levels of caffeine in *Paullinia cupana* var. *sorbilis* seeds, two types of guarana, guarana powder and commercial samples of guarana capsules and elixir were measured by HPLC.

The rates of dissolution of caffeine in media corresponding to gastro-intestinal environments and the uptake across the intestinal wall for guarana capsules and capsules containing the same amount of caffeine in lactose were compared using a standard dissolution test system and the everted gut technique respectively.

RESULTS

Caffeine was found to be the major xanthine present with small amounts of theobromine and theophylline. No trace of any other xanthines could be detected.

Amounts of caffeine found in the different samples is shown in Table 1.

The release and disolution rates of caffeine from guarana and caffeine capsules were not significantly different.

CONCLUSIONS

The xanthine responsible for the stimulant effect of guarana is caffeine. Therefore those who take guarana are expected to show the effects, overdosage symptoms and drug interactions associated with caffeine.

The levels of caffeine in the recommended dose of guarana capsules approximates to that in a medium sized cup of coffee.

There appears to be little evidence that caffeine uptake is different for guarana compared with caffeine alone.

Table 1
Percentage of caffeine and caffeine-tannin complex GU4 in samples of guarana preparations measured by densitometry

Sample % w/w	Caffeine content
Seeds of *Paullinia cupana*	2.65
Guarana stick from museum, Chelsea Department of Pharmacy	2.55
Guarana stick (supplier A) purchased from retail supplier	2.30
Capsules of guarana powder obtained from commercial source A	2.25
Powdered guarana obtained from commercial supplier A	2.10
Powdered guarana obtained from commercial supplier B	2.35
Elixir of guarana (supplier A) purchased from retail store	0.80(w/v)

REFERENCES

1. BERTHEMOT M., DECHASTELUS P., 1840, *Joumal de Pharmacie*, 26, 518-531.
2. HENMAN A.R., 1982, *J. Ethnopharmacol*, 6, 311-338.