10. Ito, K. and Furukawa, H., **J. Chem. Soc. Chem. Commun.**, 1969, 653.

11. Anthonsen, T., McCabe, P.H., Crindle, R.M. and Murray, R.D.H., **Tetrahedron.**, 1969, 25, 2233.

12. Yonemitsu, M., Fukuda, N., Kimura, T. and Komori, T., **Liebigs Ann. Chem.**, 1986, 1327.

13. Fukuda, N., Yonemitsu, M. and Kimura, T., **Chem. Pharm. Bull.**, 1986, 34, 2868.

14. Savona, G., Bruno, M., Paternostro, M., Marco, J.L. and Rodriguez, B., **Phytochemistry.**, 1982, 21, 2563.

15. Rahman, A.U. and Ahmad, S., **Phytochemistry**, 1988, 27, 1882.

16. Anthonsen, T., McCabe, P.H., McCrindle, R. and Murray, R.D.H., **Chem. Commun.**, 1966, 740.

17. Budzikiewicz, H., Djerassi, C. and Williams, D.H.; Structure Elucidation of Natural Products by Mass Spectrometry, Vol. II Holden-Day, San Francisco, 1964, 135.

18. Ahmad, M., Khaleque, A. and Wahed Mian, M.A., **Indian J. Chem.**, 1978, 16B, 317.

Determination of acetaminophen in presence of codeine in pharmaceutical formulations by derivative spectrophotometry

J. HANAEE,
Dept. of Pharmaceutical Chemistry, Medical Sciences, University of Tabriz, Tabriz, IRAN.

Received 21 May 1996

First derivative U.V. spectrophotometry has been used for the assay of acetaminophen in presence of codeine. Acetaminophen has been assayed by measuring the first derivative absorbances at 263.4 nm. The concentration of acetaminophen has been calculated without interference of codeine. The procedure is simple and rapid, and provides accurate and precise results.

ACETAMINOPHEN-CODEINE tablets are widely used as analgesic antipyretics. Several methods have been published for the determination of acetaminophen in pharmaceutical formulations, alone or in presence of other components. They include colorimetric, titrimetric, HPLC, GLC and orthogonal function methods[1-6]. All these methods are, however, time consuming and require sophisticated equipments. Therefore, the purpose of the present investigation is to develop a rapid and simple U.V. first derivative spectrophotometric method for the determination of acetaminophen in presence of codeine in pharmaceutical formulations which can be easily adopted in a drug control laboratory as well as pharmaceutical industry.

Pure acetaminophen powder and codeine phosphate were purchased from Merck company and acetaminophen-codeine tablets from Iranian Daroupakhsh pharmaceutical company. Acetaminophen stock solution (50 mg/l) was prepared in 96% ethanol. The first derivative U.V. spectra of working standard solutions, containing 10-20 mg/l of acetaminophen were recorded over the 200-400 nm range against solvent blank and the absorbances at 263.4 nm were measured using Shimadzu double beam spectrophotometer. Accurately weighed amounts of pure acetaminophen with increasing amounts of pure codeine were dissolved in the ethanol. Acetaminophen concentration was obtained by interpolating the calibration curve (Table 1). Also the

Table 1: Mean recovery of acetaminophen in the presence of codeine (pure solution)

Added acetaminophen mg/Lit)	added codeine (mg/Lit)	measured acetaminophen (mg/Lit)	recovery (%)
10	0.00	9.93	99.30
12.20	0.50	12.08	99.01
12.20	0.50	12.08	99.01
15.50	2.50	15.70	101.29
17.80	5.50	17.65	99.16
20.00	9.50	19.80	99.00

Table 2 : Mean recovery of acetaminophen in the presence of codeine (tablets)

Calculated acetaminophen (mg/Lit).	codeine (mg/Lit)	measured acetaminophen (mg/Lit)	recovery (%)
10.00	0.46	10.04	100.40
15.00	0.69	14.94	99.60
20.00	0.92	20.03	100.15

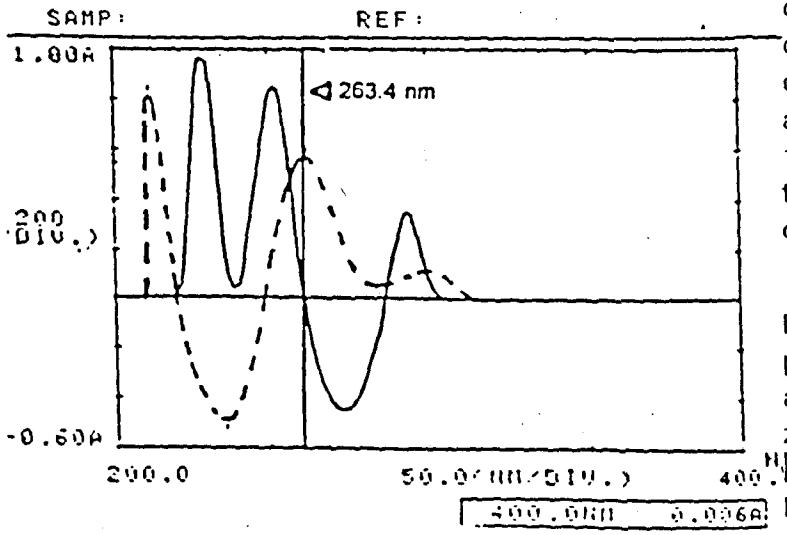

Fig. 1: First derivative spectra of acetaminophen (—) and codeine (—) in ethanol 96%

determination of acetaminophen in acetaminophen-codeine tablets (acetaminophen, 325 mg and codeine, 15 mg) was carried out. A portion of the fine and homogenised powder of the tablets equivalent to 10 mg of acetaminophen was accurately weighed, transfered to a 50 ml volumetric flask and the absorabces at 263.4 nm were measured (Table 2).

Because of the extensive overlap of the spectral bands of the compounds, conventional U.V. spectrophotometry can not be used for quantitation of acetaminophen in the mixture. Transformation of zero-order spectra to the first derivative mode has resolved the overlaping bands into their component bands so that the first derivative spectrum of acetaminophen appears at 263.4 and 302.8 nm while of codeine 227.8, 251.2 and 294.2 nm (Fig. 1). Considering these, 263.4 nm was selected as optimum

working wavelength for the determination of acetaminophen, because this point is the zero-crossing wavelength of codeine. The calculated and measured concentrations of acetaminophen at the optimum working wavelength are in very good agreement (Tables 1 and 2).

REFERENCES

1. Plakogiannis F.M. and Saad A.M.; **J. Pharm. Sci.**, 1975, 64; 1547.
2. Lotfi E.A.; **Can. J. Pharm. Sci.**, 1980, 15, 1191.
3. Carnevale C.; **J. Pharm. Sci.**, 1983, 72, 196.
4. Srivastava M.K., Ahmad S., Singh D. and Shukla I.C.; **Analyst.**, 1985, 110; 735.
5. Mahgoub H., **Drug Dev. Ind. Pharm.**, 1990, 16, 1011.
6. Milch G. and Szabo E; **J. Pharm. Biomed. Anal.**, 1991, 9, 1107.

Saccharification Studies of Lignocellulosic Biomass from Antigonum Leptopus Linn

S. HARI KRISHNA[1]* Y. PRABHAKAR[2] AND R. JAGANADHA RAO[2]

[1]J.S.S. College of Pharmacy, S.S. Nagara, Mysore - 570 015.

[2]Biotechnology Divn., Dept. of Chemical Engineering, Andhra University, Visakhapatnam - 530 003.

Received 20 June 1996

The ability of Trichoderma reesei QM-9414 cellulose complex to hydrolyse lignocellulosic biomass of Antigonum leptopus Linn was studied. Alkaline H_2O_2 pretreatment; 50°, pH 4.5, cellulose, 40 FPU/g substrate and substrate 2.5% were found to be optimum. Reaction time was reasonably less (24 h) with A. leptopus leaves compared with other substrates (48 h and more) due to the fine microsrystalline cellulose present in the leaves of A. leptopus.

CELLULOSE is an important renewable raw material produced in large amounts by plants.[1] Enzymatic saccharification of cellulose to produce sugars, which can later be transformed to chemicals or fuels is considered as a biotechnological process with enormous potential[2]. So far, significant progress was made using materials like saw dust,[3] News paper[4], tissue paper,[5] sugarcane bagasse,[6] wood substrates[7] and straw[8]. Studies were also performed on lignocellulose of **Onopordum nervosum** (Bioss)[2]. Screening suitable substrates from various lignocelluloses is important for designing an economically feasible process. By the initial studies carried out to determine new sources, we the initial studies carried out to determine new sources, we identified a new lignocellulosic material **A. leptopus** Linn, a weedy creeper, which is abundatly available in almost all parts of India and has not been exploited commercially. The crystallinity of the cellulose present in its leaves was found to be very less compared to other raw materials. Transforming this biomass would permit not only a new source of energy and chemicals but also give good yield in a shorter time.

T. reesei QM-9414 (NCIM 1186) was procured from NCL, Pune. Cellulose production and partial purification were carried out as per Mandels **et al** (1976)[9].

A. leptopus leaves were collected in Andhra University area, Visakhapatanam. Sun-dried leaves

* **For correspondence**