(about 10 cm^{-1}) and suggests the coordination of imine nitrogen to the metal ions.

In ^{13}C NMR spectra, the downfield shift of C = O carbon from 173·91 δ in the ligand to 176·79 δ in the La^{3+} complex confirms coordination of the carbonyl group. The C = N carbon too is shifted downfield from 150·076 δ in the ligand to 152·266 δ in the La^{3+} complex.

The electronic spectra for the Nd^{3+}, Ho^{3+} and Er^{3+} complexes reveal the red shift of the *f–f* bands compared to the aquo ion (Table III). The β and Sinha's δ parameter[15] for the three complexes have been calculated.

The hypersensitive band shapes of Ho^{3+} and Er^{3+} complexes resemble closely the 8 coordinate shapes reported by Karraker[12]. From analysis, IR, conductance and electronic spectral data, therefore, a probable coordination number of eight can be proposed for all the complexes of NANIH other than La^{3+} and Nd^{3+} complexes. Although from the consideration of analysis and IR, a coordination number of ten can be assigned to the La^{3+} and Nd^{3+} complexes, no evidence could be obtained from the electronic spectral shapes, because of lack of suitable model compounds for shape comparison for the Nd^{3+} ion.

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TASTE RESPONSIVENESS TO PHENYL-THIO-CARBAMIDE AND GLUCOSE DURING MENSTRUAL CYCLE

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Abstract

Taste sensitivity to Phenyl-thio-carbamide (PTC) and gustatory response to glucose have been estimated in different phases of menstrual cycle, in Indian women. The intensity and pleasantness responses to glucose were calculated on the 7-point and 6-point scale respectively. Seven dilutions of the test solution, ranging from 2·0 M with successive half dilution were given to the subjects. The intensity rating increased with an increase in the strength of glucose solution. Maximum pleasantness peak was at 1·0 M solution in all phases of menstrual cycle. During ovulatory phase pleasantness scores were higher. The PTC responses were dynamic and showed a shift from nontasters to tasters during ovulatory phase.

A VARIETY of sensory changes are experienced by women during different phases of menstrual cycle[14,15]. These changes seem to be linked with the changes in perception[4]. Olfactory sensitivity was found to be most acute in the midcycle period[12]. Several investigators have reported that changes in auditory acuity occurred during menstrual cycle[7]. Changes in detection threshold for light touch and two point discrimination have also been found to vary during follicular and luteal phase[15]. Similarly it has been reported that gonadal hormones influence palatability and spontaneous ingestion of a number of sweet solutions[11], and the difference in ingestion of sweet solution is thought to be caused by the stimulatory influence of ovarian hormones on the taste regulatory mechanism[8,11].

One of the important biological determinant of taste is the genetic component and in this regard PTC (Phenyl-thio-carbamide) has been extensively used to study taste responses related to Mendelian factors[1]. Whether genetically linked PTC taste responses are modulated during menstrual cycle is not clear[13]. The present work has, therefore, been undertaken to study PTC responses during menstrual cycle in human females and see if any correlation exists with the varying gustatory responses to glucose, observed during different phases of the menstrual cycle.

Methods

Gustatory responses to glucose and PTC were studied in 12 young healthy females, of 18–30 years age, belonging to University College of Medical Sciences. The tests were performed daily during menstrual (day 1–5), ovulatory (day 10–15) and premenstrual phase (day 20–25), under conditions of overnight fast and also after food.

The taste sensitivity to PTC was investigated as per method of Harris and Kalmus[9]. Tasters were labelled those who were able to taste PTC in solutions of lower concentrations (0·008–0·00006%, solution 5 to 12) (sensitive) and non-tasters were those who were able to taste PTC in only higher concentrations (0·13–0·016%, solution 1–4) or not at all, (less sensitive).

For the taste responses to glucose, 7-dilutions of glucose solutions, (maximum concentration 2·0 M, with successive half dilution), were used for each category scale[10]. The subjects were instructed to taste three solutions of each concentration in the same condition, and to rate the taste intensity on 0–6 category scale (0- no taste, 6-extremely strong taste). The pleasantness rating were provided on a 6-point scale (1-extremely disliked, 6-extremely liked). No neutral point was provided to denote indifference; so that the subjects were required to state whether they liked or disliked the stimulus.

Results

Figure 1 shows the PTC thresholds in different phases of menstrual cycle. One can observe the bi-modal distribution for PTC response. In menstrual phase (strip A), the "tasters" respond to lower concentration (solution Nos. 8 to 12), and the "non-tasters" to only higher concentrations (solution Nos. 2 to 5). During ovulatory phase (strip B), the tasters and non-tasters both showed a shift in the sensitivity towards lower concentrations. As compared to the 30% of the subjects responding to the lowest concentration (solution: 12: Strip A) during menstruation, 45% of the subjects responded to this P.T.C. concentration during ovulatory phase (strip B). During premenstrual phase (strip C) response was nearly similar to the menstrual phase.

The relation between taste intensity and taste pleasantness and concentration of glucose under fasting and after food during different phases of menstrual cycle are shown in Fig. 2. Intensity estimate increases with the increase in concentration of glucose solution in all the phases. Hedonic responses also showed an increase with the increasing concentration, with the maximum pleasantness peak obtained at 1·0 M solution, after which it decreases. Further, the hedonic scores were higher during ovulatory phase (Mean scoring 5·2), as compared to the other phases of the menstrual cycle (Mean scoring 4·8).

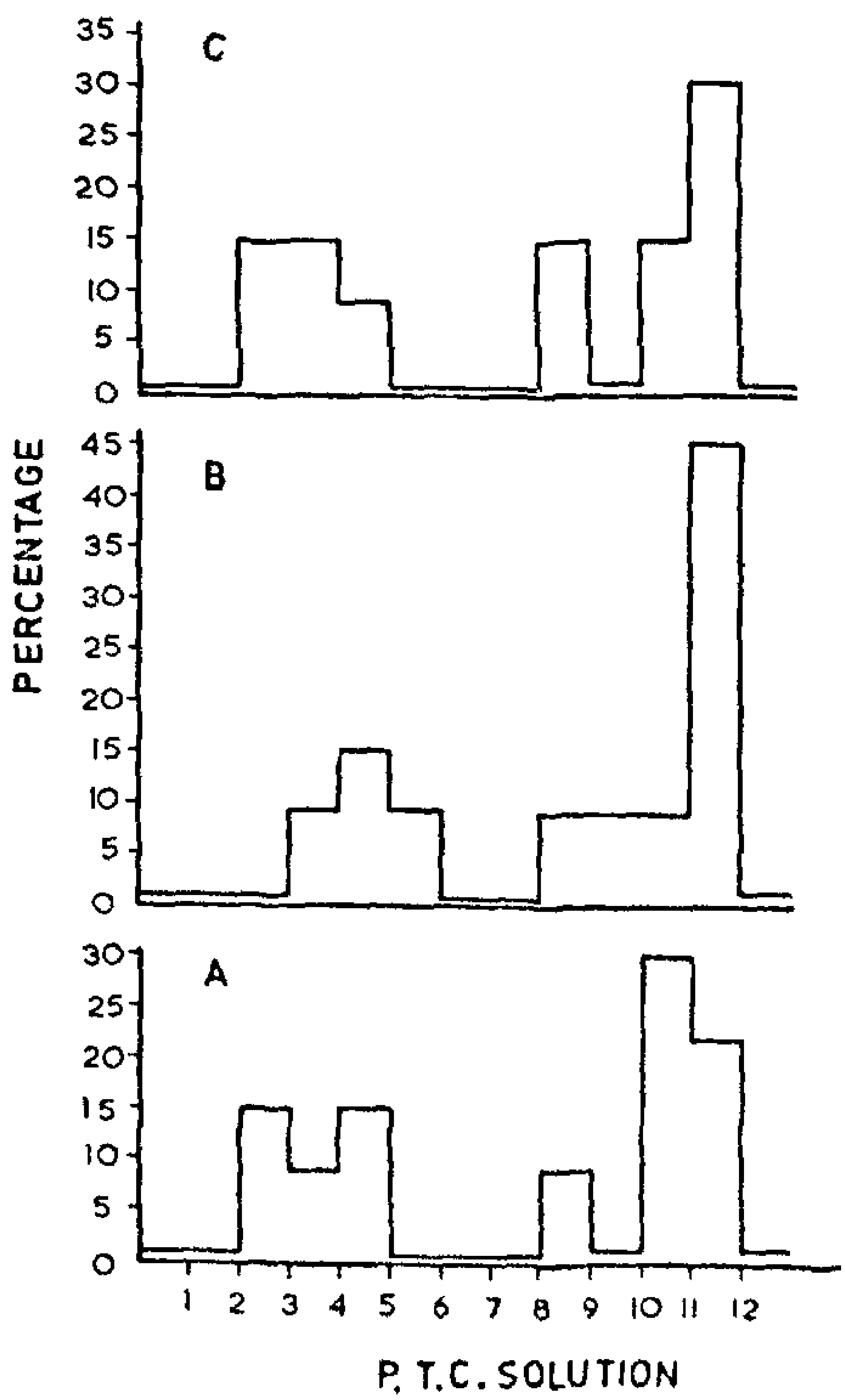

Fig. 1. P.T.C. thresholds in females in different phases of menstrual cycle. A—Menstrual Phase, B—Ovulatory Phase, C—Premenstrual Phase.

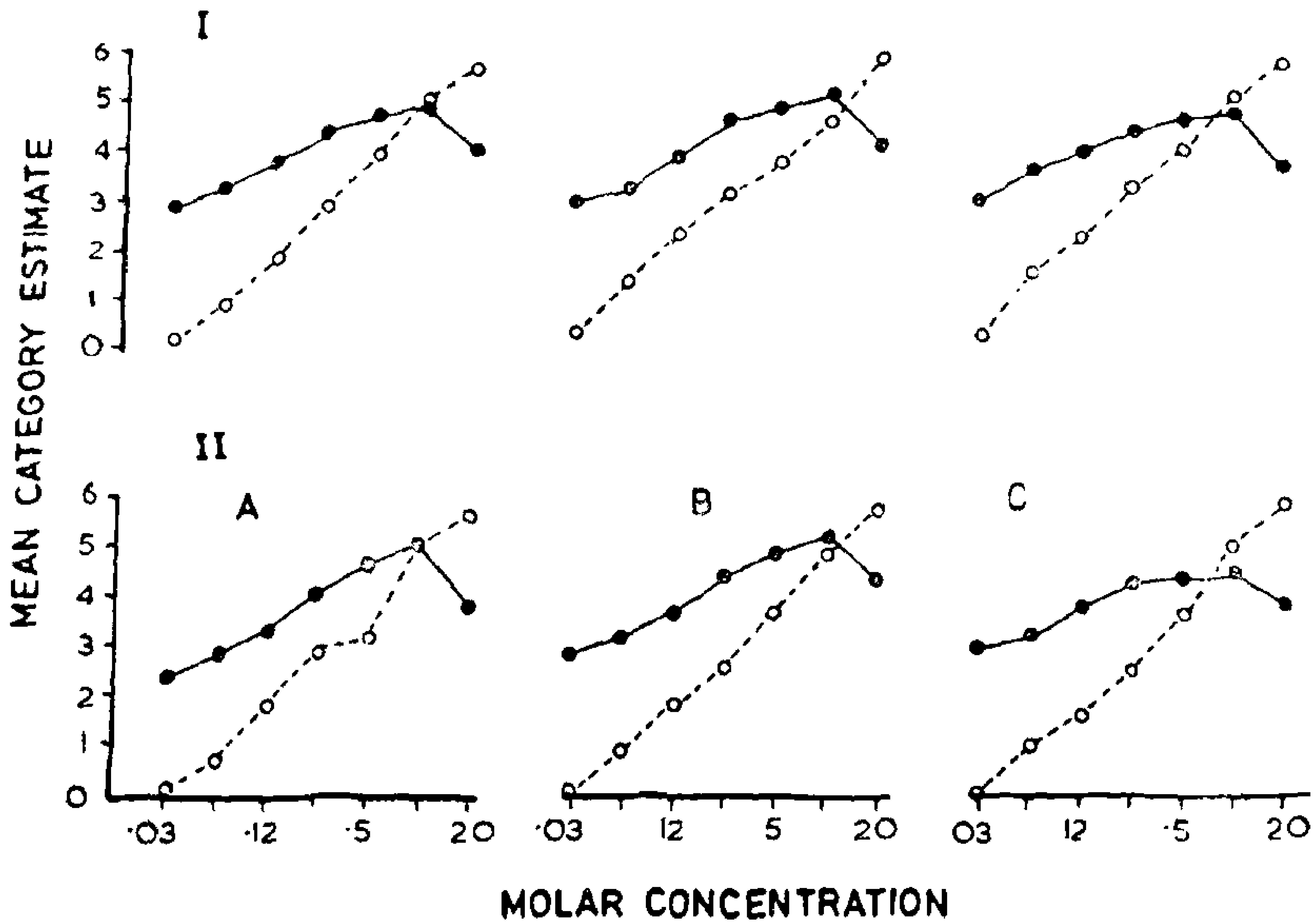

FIG. 2. Relation between taste intensity, taste pleasantness and concentration of glucose. I—under fasting condition, II—after food condition (——— Pleasantness, ---- Intensity). A—Menstrual phase, B—Ovulatory phase, C—Premenstrual phase.

Discussion

The present results indicate a distribution of PTC tasters and non-tasters to be 67% and 33% respectively, during the menstrual phase. The tasters percentage increased to 83·4% during ovulatory phase. Though the percentage distribution of tasters and non-tasters during menstrual phase is lower as compared with the ovulatory phase, the menstrual phase values are comparable to the normal distribution of tasters and non-tasters in males[20]. These observations suggest that genetically linked PTC responses are labile and can be influenced by internal factors. Beiguelman[2] studied the taste sensitivity to PTC during menstrual and non-menstrual phase, and was unable to demonstrate any change, whereas Glanville and Kaplan[6] found an increased sensitivity during menstruation in some subjects, and no change in other subjects. Hoyme[13] reported increased sensitivity to PTC in mid cycle phase which is comparable to the results obtained by us in the present series.

Gustatory responses to glucose have also shown higher ratings during ovulatory phase as compared to the menstrual phase. This ind[illegible] that during ovulatory phase, sensitivity to sweet taste increases. Sweet substances not only taste sweeter but are also found more pleasant. The enhancement of hedonic responses is particularly observed in higher glucose concentration, but the break point for maximum pleasantness does not change and is observed at 1·0 M.

Recent studies by Dua-Sharma and Kanaka[19] on taste intensity and taste hedonics during the menstrual cycle in human females, showed that the values for sweet preference were less during menstruation and high at ovulation, and support our results of the present series. Their results however differ from the present work in that the highest rating for pleasantness not only shifted to 1·0 M during ovulatory phase but showed no break point upto 2·0 M. Further, Dua-Sharma *et al.*[18] showed that girls of pre-pubertal age (upto 10–11 yrs.) have not shown any cyclic variations in taste profile to sweetness indicating that gustatory changes in adult females may be related to variations of menstrual cycle.

During ovulatory phase, among other changes, the increase in the titer of estrogen is known to be significant. Whether estrogen level influences the gustatory responses, does not seem to have a direct answer in human females. But there are a number of experimental studies[3-17], showing the influence of circulating gonadal hormones on taste intensity and hedonics. Female rats show a strong preference to glucose during proestrus/estrus phase[16]. Wade and Zucker[8] observed that the injection of testosterone decreased the saccharine consumption. Similarly, gonadectomy did not produce change in sweet responsiveness in male rats, but a decrease in glucose consumption was observed in the females[3]. It is also shown that female rats consumed more glucose solution of higher concentration than males[4]. All these studies tend to suggest the facilitatory influence of estrogen on sweet responsiveness. That the estrogen can also modulate genetically linked taste responses is shown by the shift of PTC taste responsiveness being maximal during ovulatory phase. The gustatory system thus appears labile and related both to the genetic and the environmental (internal and external) determinants.

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ANALYSIS OF CARBOHYDRATES BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

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ABSTRACT

High performance liquid chromatography was utilised for the separation of acidic sugar oligomers and partially methylated methyl glucosides.

VARIOUS chromatographic techniques have been in use for the separation of carbohydrates. Paper and column chromatographic techniques are commonly used and are inexpensive ; but, they are slow processes and are not suitable for quantitative estimations. Gas-liquid chromatography is very good for quantitative estimations but this technique is applicable only to volatile derivatives. High performance liquid chromatography is an excellent technique, because, this can be used for rapid quantitative estimations, qualitative detections and also for preparative purposes. μ-Bondapak (carbohydrate) column has been used for the separation of monosaccharides and oligomers from amylose[1,2]. μ-Bondapak C-18 column has been used for the separation of oligomers in the form of their acetates[3]. In this communication we report some more applications of high performance liquid chromatography for the separation of acid sugars and partially methylated methyl glucosides in the form of their acetates with the help of bonded type C-18 column.

The individual aldobio-, aldotrio- and aldotetraouronic acids were acetylated with pyridine and acetic anhydride. The materials were then injected into