# Comparison of nutritive values of some edible wild fruits at ripe and unripe stages.

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COMPARAISON DES VALEURS NUTRITIVES DE QUELQUES FRUITS SAUVAGES COMESTIBLES AUX STADES MUR ET VERT

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RESUME - Dix fruits sauvages comestibles, communément trouvés dans les forêts de la Vallée de Kathmandou, ont été examinés aux stades mûr et vert, pour leurs valeurs nutritives en matière sèche, pH du jus, sucres solubles totaux, protéines brutes, cendres totales et sodium, potassium, calcium et magnésium.

## INTRODUCTION

Fruits are an important source of human nutrition. They contain different important food constituents such as sugars, proteins, vitamins, organic acids and minerals. The nutritive values of most of the cultivated fruits are well known (GOPALAN et al, 1980). But the studies on the nutritive values of edible wild fruits have been very limited (BAJRACHARYA, 1980 a).

In Nepal, edible wild fruits are very popular and found in great abundance (BAJRACHARYA, 1980 b). They play an important role in the nutrition of local people. For some people, edible wild fruits are the only source of fruits. Despite the economic importance of edible wild fruits in Nepal, studies on the nutritive values have been very limited. The first systematic study on the availability and the nutritive values of nepalese edible wild fruits was reported by BAJRACHARYA (1980 a, b). The author reported altogether 45 edible wild fruits from the Kathmandu valley (BAJRACHARYA, 1980 b) and the nutritive values of 40 of them were determined (BAJRACHARYA, 1980 a). However, in that work (BAJRACHARYA, 1980 a) the information was provided only on the nutritive values of the ripe edible wild fruits and the differences in the nutritive values of ripe and unripe edible wild fruits have not yet been reported. In the present investigation, we compare the nutritive values, in terms of dry matter, organic acid, total soluble sugar, crude protein, ash and sodium, potassium, calcium and magnesium contents, of ten edible wild fruits at their ripe and unripe stages. The analysed fruits are : *Castanopsis tribuloïdes* (SM.) A.DC. (musure katush) (local names are given in the brackets), *Maclura cochinchinensis* (LOUR.) CORNER (damaru, dewar), *Mahonia nepaulensis* (jamane mandro), *Myrica esculenta* BUCH.-HAM.(kaphal), *Prunus cerasoides* D. DON (ban painyu), *Rubus ellipticus* SMITH (pahelo aaiselu), *Sarcococca coriacea* (HOOK. f.) SWEET.(prit bir),*Tetrastigma serrulatum* (ROXB.)PLANCH. (char, chare), *Viburnum mullaha* BUCH.-HAM. ex D. DON (molo) and *Zizyphus incurva* ROXB. (hade bayar).

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## MATERIALS AND METHODS

### Collection of fruit samples.

Sufficient amounts of fresh fruits were collected from different parts of the Kathmandu valley. The fruits were stored at 4°C and were processed generally within 24 hours after collection. Only edible parts of the fruits were used for the chemical analysis.

### Distinction of ripe and unripe fruits.

The fruits were distinguished as ripe and unripe on the basis of their morphological features following WINKLER (1962). Fruits which were green in color, hard in texture and bitter or pungent in taste were regarded as unripe, and the fruits which were red, yellow, blue or black in color, soft in texture and sweet in taste were considered ripe.

### Chemical analysis *

*Dry matter.*

Dry matter content was determined by drying the fruits at 80°C for 24 hours.

*pH of fruit juice.*

The pH values of fruit juices were measured using a pH meter.

*Total water soluble sugar in the fruit.*

Total water soluble sugar in the fruit was determined by anthrone technique (WITHAM et al, 1971).

*Total crude protein content.*

Total crude protein content was determined by estimating the percentage of nitrogen by microkjeldahl technique. The values obtained for nitrogen were multiplied by the factor 6.25 to get the values for crude protein.

*Total ash content.*

Total ash content was determined by the standard dry ashing technique (PAECH and TRACEY, 1956).

*Mineral contents.*

The estimation of sodium and potassium was done by the modified techniques of flame photometric methods and the estimation of calcium and magnesium by modified EDTA or versenate titration method (JACKSON, 1953).

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* - Dry fruit powders were used for the estimation of water soluble sugars, crude protein, ash and mineral elements.

The values mentioned in the results are expressed in fresh weight basis and are the mean of three replicates. Further details of methods are given elsewhere (BHANDARY, 1978 ; SHRESTHA, 1978).

## RESULTS AND DISCUSSION

The results of biochemical analysis is shown in Fig. 1-9. It shows that in most cases ripe and unripe fruits differ in their chemical composition. Only in the biomass (dry matter) content did most of the fruits show little difference at ripe and unripe stages. SAHA (1974) also did not find any significant variation in dry matter contents of unripe and ripe fruits of «lapsi» *(Choerospondias axillaris).*

The organic acid contents as indicated by pH values of the fruit juices showed, in general, only slight difference in the ripe and unripe fruits in most cases. In some cases pH values of fruit juices were higher in ripe fruits, where as in some other fruits they were higher in unripe fruits. A gradual decrease in acidity in ripe fruits has been reported in strawberries (WOODWARD, 1972).

The total sugar content in the fruit, however, was higher in all fruits when they were ripe (Fig. 3). In *Castanopsis, Myrica, Prunus, Rubus* and *Zizyphus,* the total sugar content in the ripe fruits was nearly double the amount found in the unripe fruits. The increase in sugar content is most probably the reason for the sweeter taste of most of the ripe fruits. A similar increase in the total sugar content in ripe fruits has been reported in many cultivated fruits also (CONSTANTINIDES and BEDFORD,1964 ; WOODWARD, 1972 ; KETIKU, 1973 ; SUBRAMANYAM et al, 1975).

Protein and total ash content varied in the fruits depending upon the stages of their maturity. It was reported that in several fruits the protein content is higher in the unripe fruits, while in others it is higher in ripe fruits (Anonymous, 1973). However, the total ash content did not change during the ripening of *Choerospondias axillaris* (SAHA, 1974).

The minerals contents in the edible wild fruits were generally higher in the unripe fruits (Fig. 6-9). In *Castanopsis, Mahonia, Myrica, Prunus, Sarcococca* and *Viburnum,* the sodium content is appreciably higher in the unripe fruits (Fig. 6). Except in *Castanopsis,* the potassium content in unripe wild fruits is either equal or higher than in the ripe fruits. But KOHL (1966) reported that potassium increased more in the ripe fruits of Cox's orange. The calcium content is also found to be higher in the unripe wild fruits than in the ripe ones. A similar decrease in calcium content during maturity was reported in figs and mangoes (Anonymous, 1973). Except in *Castanopsis* and *Rubus* the magnesium content is also higher in unripe fruits than in the ripe fruits (Fig. 9).

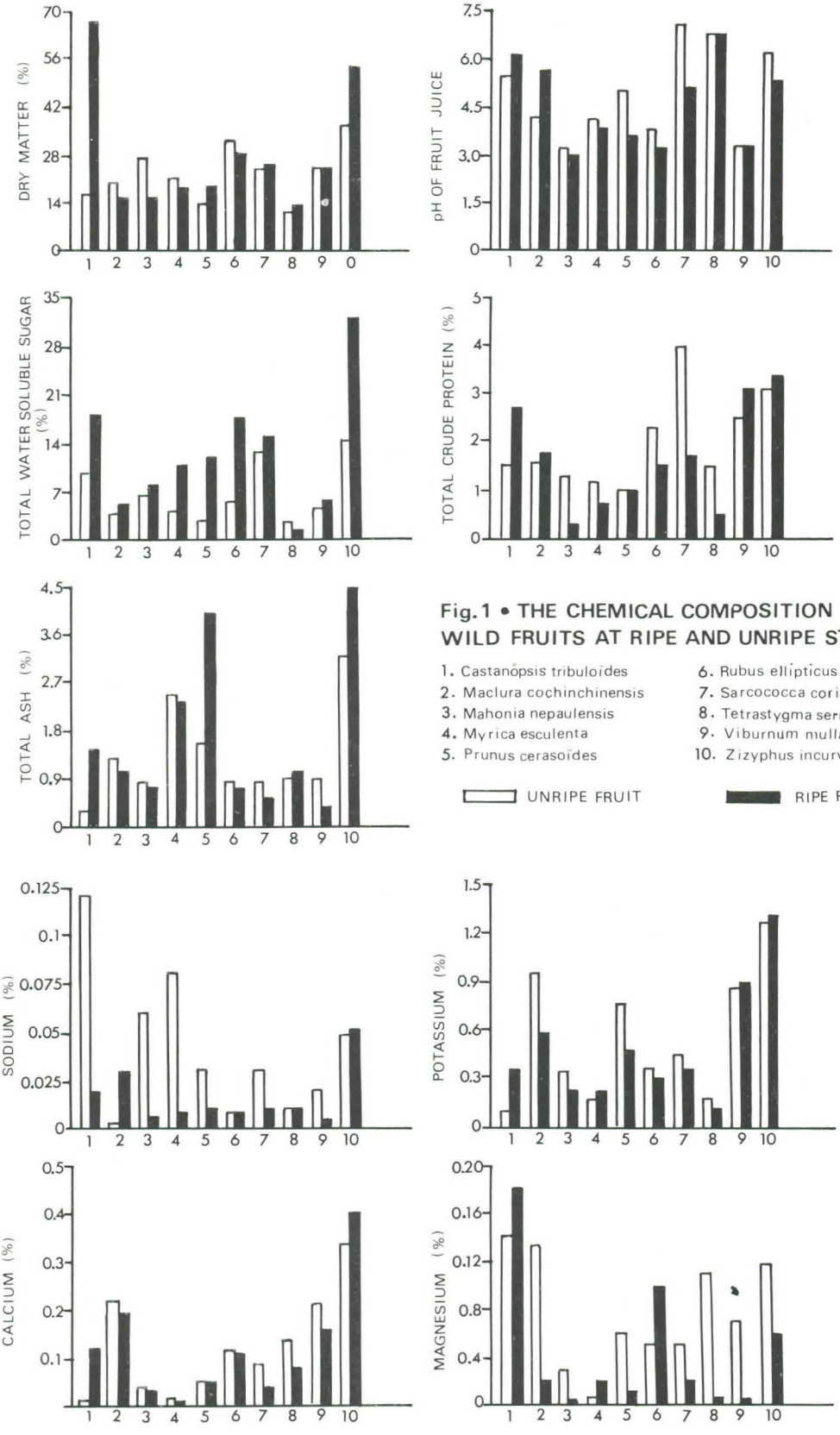


**Fig. 1 • THE CHEMICAL COMPOSITION OF EDIBLE WILD FRUITS AT RIPE AND UNRIPE STAGES.**

1. Castanopsis tribuloides
2. Maclura cochinchinensis
3. Mahonia nepaulensis
4. Myrica esculenta
5. Prunus cerasoides
6. Rubus ellipticus
7. Sarcococca coriacea
8. Tetrastygma serrulatum
9. Viburnum mullaha
10. Zizyphus incurva

It thus appears that while most of the edible wild fruits contain, in general, nearly the same amount of biomass at ripe and unripe stages, the sugar content is significantly higher in the ripe fruits than in the unripe ones. However, the content of sodium, potassium, calcium and magnesium appears to be, with some few exceptions, higher in unripe fruits.

The fruits are generally eaten when they are ripe. The present study shows that such ripe fruits, though may be rich in sugar content, are poor sources of important mineral elements.

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## REFERENCES

Anonymous.
Food composition tables, compiled by Carribean food and nutrition institute (1973).

BAJRACHARYA (D.).
Nutritive values of nepalese edible wild fruits.
*Z. Lebensmittel - Untersuchung und - Forschung*, 171, 363-366 (1980 a).

BAJRACHARYA (D.).
Edible wild fruits of Kathmandu Valley.
*Fruits*, vol. 35, n° 7-8, p. 465-478 (1980 b).

BHANDARY (H.R.).
Biochemical analysis of some edible wild fruits at unripe and ripe stages of Kathmandu Valley.
*Post-graduate thesis submitted to Botany Instruction Committee, Tribhuvan University (1978).*

CONSTANTINIDES (S.M.) and BEDFORD (C.L.).
Sugars in red tart cherries and their changes during maturation.
*J. Food Sci.*, 29 (6), 804-807 (1964).

GOPALAN (C.), RAMA SASTRI (B.V.) and BALASUBRAMANIAN (S.C.).
Nutritive values of Indian foods.
*Nat. Inst. Nutrition, ICMR, Hyderabad, India*, (1980).

JACKSON (M.L.).
Soil chemical analysis.
*Prentice Hall of India, Pvt. Ltd. New Delhi* (1953).

KETIKU (A.O.).
Chemical composition of unripe (green) and ripe plantain *(Musa paradisiaca)*.
*J. Sci. Fd Agric.*, 24 (6), 703-707 (1973).

KOHL (W.).
The distribution of calcium in apples and its changes during growth.
*Gartenbauwissenschaft*, 31 (4) 513-547 (1966) (only abstract seen).

PEACH (K.) and TRACEY (M.V.).
Modern method of plant analysis.
*Springer-Verlag*, vol. 1, 468-486 (1956).

SAHA (D.J.)
Changes in certain constituents of «Lapsi» fruits during its development and ripening.
*Bulletin H.M.G., Ministry of Food and Irrigation Dept. Food and Agriculture marketing Service, Singha Durbar Kathmandu*, 1, 6-11 (1974).

SHRESTHA (K.K.).
Studies on the biochemical composition of some edible wild fruits of Kathmandu and its vicinities at different stages of maturity.
*Post-graduate thesis submitted to Botany Instruction Committee, Tribhuvan University*, (1978).

SUBRAMANYAM (H.), KRISHNAMURTHY (S.) and PARPIA (H.A.B.).
Physiology and biochemistry of mango fruit.
*Adv. Fd Res.*, 21, 224-305 (1975).

WINKLER (A.J.).
General viticulture.
*Univ. of California Press*, 118 (1962).

WITHAM (F.H.), BLAYDES (D.F.) and DEVLIN (R.M.).
Experiment in Plant Physiology.
*Van Nostrand Reinhold Company*, 16-18 (1971).

WOODWARD (J.R.).
Physical and chemical changes in developing strawberry fruits.
*J. Sc. Fd Agric.*, 23 (4), 465-473 (1972).