DETERMINATION OF THE BAKING VALUE OF CERTAIN INDIGENOUS WHEATS BY PHYSICAL METHODS

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Introduction

It is now well recognized that purely chemical-analytical methods which determine the various constituents present in the wheat flour do not give sufficient information with regard to its baking value. Thus two flours, identical chemically, may still be baked into products of different characteristics.[1] A solution to this problem must be sought by studying the physical behaviour of flour from the time of kneading to the actual baking process. For this purpose, certain physical methods have been evolved which determine the baking properties of wheat flours and are almost universally used in baking technology laboratories.

Wheat is the staple cereal of the people of West Pakistan and forms 58 percent of the total cereal production in the Western Wing.[2] A number of varieties are grown in Pakistan but these are not similar in their physical characteristics. A variety suitable for biscuit making may not produce a well-formed loaf of bread.[3] It was thus considered important to evaluate the baking value of indigenous wheats using apparatus developed by C.W. Brabender of Germany for research in baking technology.

Materials and Methods

Out of the various varieties of wheat grown in West Pakistan, only the most common and easily available varieties like C-591, C-228, C-271, C-273 were obtained from the Cereal Botanist Agricultural University, Lyallpur.

All these varieties of wheat were milled in Brabender Laboratory Test Mill separately. The temperature of various parts of the Farinograph was maintained at 30°C. as required. The needle of the recorder was adjusted at zero of the graph paper and the following determinations were made.

(a) *Titration Curve.*—Wheat (flour, 300 g.,) was added to the bowl of the Farinograph. The switch of the Farinograph and the recording device were switched on and at the same time the water from the burette was added to the flour in the bowl till the recording needle gave a reading of 500 Farinograph Unit (F.U.) This curve is known as Titration Curve.

(b) *Normal Curve.*—The same quantity of wheat flour was taken again and the apparatus was restarted. Previously determined volume of water was added to the flour in minimum possible time. The apparatus was worked till 12 minutes after the decline of the curve started. This curve is known as Normal Curve (Figs. 1-4).

Interpretation of the Diagrams.—The normal curve in each case taken as a whole, represents the characteristic quality picture of the wheat tested. The individual factors that may be read from the graphs are as follows:

(a The water absorption in percentage to produce dough showing a consistency of 500 Brabender Units. (b) The dough developing time in minutes indicates the mixing time required by the flour from the moment doughing up starts to the time it reaches the optimal dough development attaining at the same time maximum width of the band. (c) The dough stability in minutes represents the time during which there are no changes in the consistency of the dough after it has reached its optimal development. (d) The resistance of the dough in minutes is the sum of (b),(c) and (e). The softening of the dough, measured in F.U. represents the difference in dough compactness at the commencement of the softening and its compactness after a further 12 minutes mixing.

Results and Discussion

By evaluating the normal curves given in Figs. 1 to 4, the individual values shown in Table 1 are obtained. From an examination of the data, the difference in the mixing characteristics of different varieties of wheat are at once revealed. The wheats, which require less water in order to make a dough with optimal development at 500 F.U. possess above all a very short mixing time and also lack mixing tolerance, are graded as "*soft wheats*".

The strong flour on the other hand has decidedly a greater swelling capacity and would therefore, require a greater amount of water and a longer

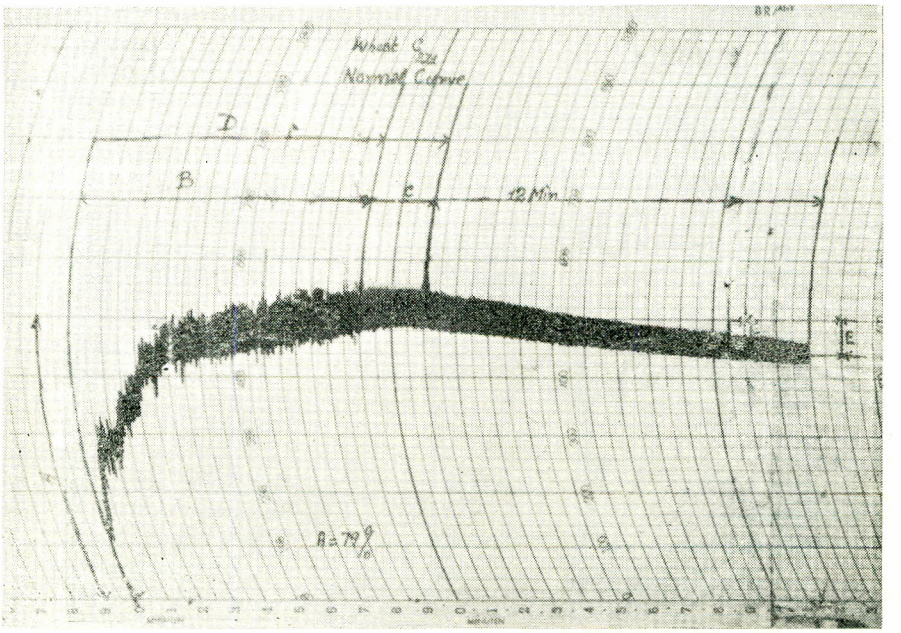

Fig. 1. — Faringram showing the normal for a strong wheat.

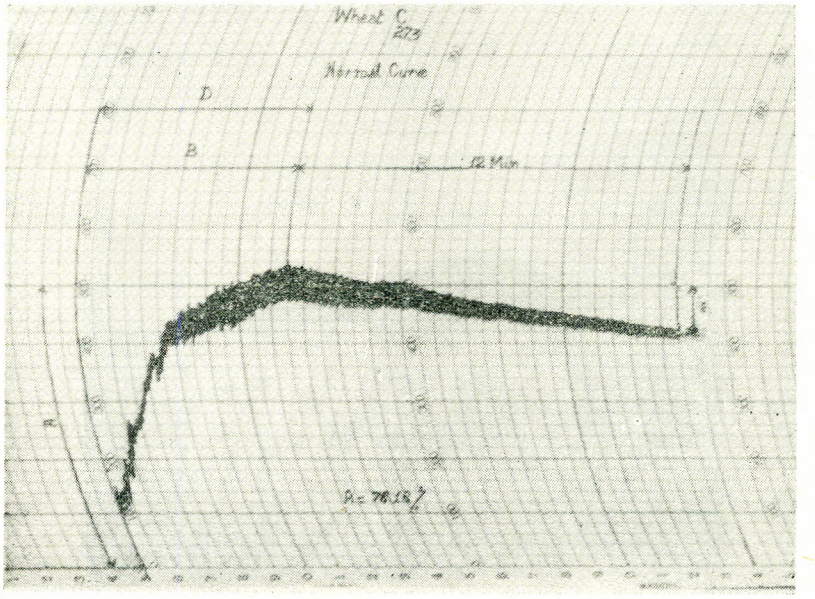

Fig. 2. — Faringram showing the normal curve for a soft wheat.

mixing time to produce a dough of optimal development. Moreover, the dough produced from this flour is much less sensitive to the mixing effect and consequently has a greater fermentation tolerance as represented by the factor (d) and by the low amount of softening given by factor (e) It is, therefore, inferred from Table 1 that wheat C-271 (Fig. 1) is strong and C-273 (Fig. 2) and C-228 (Fig. 4) are soft, while C-591 (Fig. 3) is of medium type.

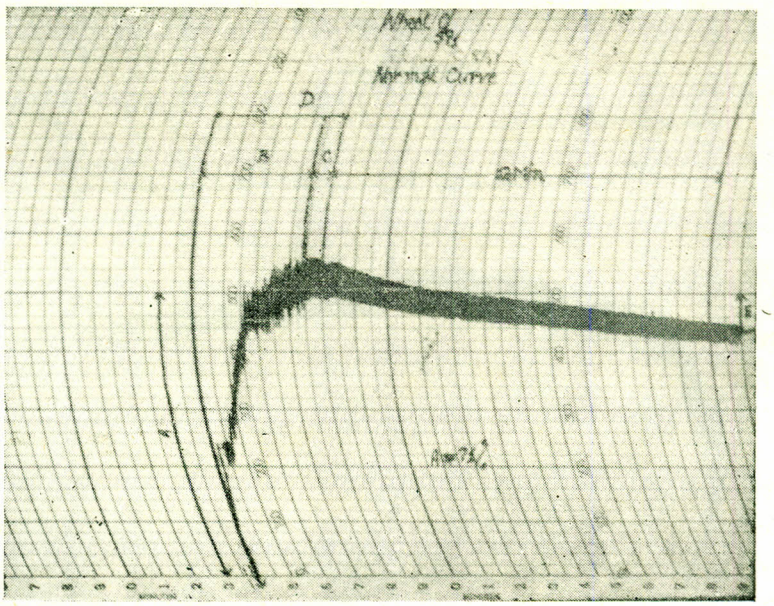

Fig. 3. — Faringram showing the normal curve for a medium wheat.

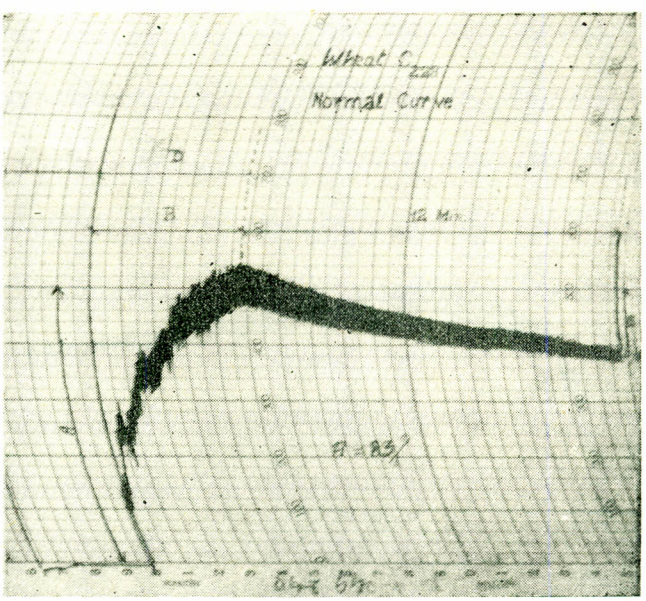

Fig. 4. — Faringram showing the normal curve for a soft wheat.

The various varietal characteristics of wheats on the basis of the physical data obtained are described below:

C-271.—This is a new variety of wheat commonly grown at Lyallpur and other districts of West Pakistan. This has been evolved as a result of hybridization C-271 (C-230 × IP 165). [4] It has high water absorption of about 76 percent and has got relatively longer dough development time producing an extensible dough. This is a strong type of wheat as appears from its normal

curve (Fig. 1) and various physical characteristics shown in Table 1. High quality of bread can be produced from this wheat flour.

C-273.—This is grown mostly in West Pakistan and has been evolved as a result of hybridization. C-273 (C 209 × C 591). It is bearded type with medium size mid-lax ears. This gives high yield as compared with C-591.[4] The water absorption of this wheat is 76.2 percent It has a shorter dough

TABLE 1.—SHOWING THE VARIOUS FACTORS FROM A TO E.

Wheat	A %	B min.	C min.	D min.	E F.U.
C-228	83	4.75	0.00	4.75	120
C-271	79	9.00	2.00	11.00	60
C-273	76	6.50	0.00	6.50	85
C-591	71	3.4	0.52	4.00	70

development time than C-271. Fermentation tolerance (d) is 6.5 which is less than that of strong wheat. Its softening of dough (e) is 85 F.U. This belongs to soft wheat varieties.

C-591.—This is good quality, high yielding, bearded wheat for average soil and wide adapatability.[4] Its water absorption is 71 percent. Although it has shorter dough development time (0.52 minutes), good quality bread can be produced from this flour due to low softening of dough, (70 F.U.), which is less than that of C-273 and C-228 and more than that of C-271. It is, therefore, classed as a medium tpye of wheat.

C-228.—This wheat gives more acreage yield than C-591. Flour from this wheat has high water absorption capacity i.e. 83 percent. It has a short dough developing time (4.5 minutes). The softening of its dough is 120 F.U. This wheat should be blended with C-271 to meet most of the Farinograph specifications for baker's products.

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VITAMIN C CONTENTS OF WILD ROSE HIPS OF WEST PAKISTAN

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Introduction

Vitamin C (ascorbic acid) is an essential dietary factor both in health and disease. Vegetables and fruits, particularly the citrus fruit, constitute its natural source while glucose forms the basis for its large scale synthesis. Besides its extremely important role as a vitamin, ascorbic acid is also used as a chemical reagent and as an antioxidant for the preservation of fats.[2] When required, the vitamin is supplied handily in the form of tablets and syrups; sometime other vitamins are also added. In many countries vitamin C syrups and concentrates are prepared from rose hips, black currants, haws, sloes, etc.[3-5]

Vitamin C syrups originating from natural vegetable sources contain not only the vitamin in heavy concentrations but also other minor plant materials such as pectins, sugars, colouring and flavouring matter etc., which add to the appeal, taste and palatability of the preparations. The production of these syrups and of vitamin C in Pakistan is highly desirable as at present they are imported at the expense of considerable foreign exchange.

Citrus fruit in the country can become and is the most abundant source for the supply of the

vitamin as such or in the form of fruit-concentrates and syrups. But, unfortunately, the fruit does not contain more highly concentrated amounts of the vitamin than some other sources to be described later in this paper. Further, the fruit value of the citrus fruit is also so high that it cannot be employed for the production of the vitamin exclusively.

It has, therefore, been considered of interest to study other natural resources than the citrus fruit for the commercial production of the vitamin concentrates in Pakistan. Already different vitamin C preparations such as juice, syrup, powder, jam, etc. based on *Emblica officinalis* fruit have been reported from these Laboratories.[6] In view of the fact that wild rose hips particularly are utilized in other countries for the preparation of vitamin C syrups, investigations have now been carried out to determine the potential of this resource in West Pakistan. In this communication, therefore, the extent of three wild rose hip varieties and their vitamin C contents are reported.

Materials and Method

Wild Rose Hips.—These were collected during September-October from places mentioned in Tables 1 and 2.

Method of Analysis.—The method of analysis has already been reported elsewhere.[7]

Discussion and Conclusion

Vitamin C contents of the hips (Tables 1 and 2) were determined at different intervals after plucking. It was found that an interval of a week or so did not affect the vitamin adversely which, therefore, indicates that the hips can be plucked and processed within a reasonable period without incurring a loss of the vitamin. The increase in the vitamin contents after a week can be explained by the fact that the hips lost some weight because of drying during storage. Nevertheless, over-storage of hips adversely affected the vitamin contents. Hips of *R. moschata*, which, to begin with, contained 108 mg., were left with only 30 mg. of the vitamin after a storage of two months.

From the data of Tables 1, 2 and 3, it is obvious that *Rosa macrophylla*, containing upto 1590 mg. vitamin C per 100 g. of the hips, is one of the richest natural resources of the vitamin. The vitamin C contents of all other fruits and vegetable are less than that of *R. macrophylla*, and with the exception of *Emblica officinalis* they are generally comparable with those of *R. moschata*. In addition, the hips of *R. macrophylla* have less tannins and contain other vitamins. Their keeping quality under ordinary conditions, at the same time, is decidedly better than most of the other fruits. It would appear, therefore, that these hips are most suitable for the production of vitamin C preparations.

The vitamin C contents of *R. webbiana* (Table 1) were 224 mg. per 100 g. of the hips. It should be stated, however, that this variety was confined to only one place i.e. Naran and its extent as well as quantity was rather limited.

A rich source as it is, the availability of *R. macrophylla*, at present, is also limited but not to the same extent as that of *R. webbiana*. The growth of this rose is scattered. Rather thinly populated

TABLE 1.—VITAMIN C CONTENTS OF *Rosa moschata And Rosa webbiana* HIPS.

Variety	Area	Quantity	Vitamin C contents (mg./100 g.)* when hips are analysed.	
			Within 3 days	After a week
Rosa moschata	Murree	Large	87.3	125.0
	Kuldana	Large	47.0	88.4
	Lower Topa	Large	42.8	80.0
	Charehan	Large	43.3	—
	Abbottabad	Small	62.4	—
	Ghora Dakka and Donga Gali	Large	—	84.0
	Shogran	Small	74.8	—
	Garaid	Small	68.0	—
Rosa webbiana	Naran		—	224

*The results are, the mean of analysis on two or more than two samples collected from different places in the same locality.

TABLE 2.—VITAMIN C CONTENTS OF *Rosa macrophylla* HIPS.

Area	Quantity	Vitamin C. contents (mg./100 g.)† when hips are analysed.	
		Within 1-3 days	After a week
Nathiagali Hills	Fairly large	1154.0	1380.0
Mushkpuri Hills	Small	1284.0	1336.0
Shogran	Small	1590	1580.0**
Naran	Very large	—	1296.0

† The results are the mean of analysis on two or more than two samples collected from different places in the same locality.

** This analysis was carried out after three weeks instead of the usnal one week.

TABLE 3.—AMOUNTS OF VITAMIN C IN VARIOUS FOODSTUFF.[8]

Fresh fruits etc.	Amount of vitamin C (mg./100 g.) in the fresh or raw food (Typical values)
Emblica officinalis ..	720 (Max.)[9]
Black currants (Freshpulp)	250–200
Papaya	100–50
Guava	100–50
Strawberries	80–60
Orange juice	70–50
Lemon juice	60–40
Grape fruit	45–35
Tomato juice	30–20
Pineapples juice ..	30
Apples	5–3
Cauliflower	80–60
Cabbage	80–60
Spinach (and other green-leaf vegetables) ..	70–60
Turnips	40–20

colonies, further devastated by grazing goat and cattle, will not yield sufficient quantity of the hips. If vitamin C concentrates have to be based on this rose, measures will have to be taken to protect its present bushes and to propagate its further growth in other suitable areas. It is needless to emphasise here that this rose, with its so high contents of vitamin C, can become one of the most useful minor forest products.

On the other hand, although *R. moschata* contains far less quantities of the vitamin as compared with *R. macrophylla*, its growth is rather extensive. Bushes of enormous size which may bear over one pound of the hips per branch grow all over the Murree and surrounding hills. Thus the disadvantage of its low vitamin C content is adequately compensated for by its large available quantity. Its vitamin C contents are, at any rate, comparable with many common fruits and since its present fruit utility is nil, it would constitute an ideal source for the preparation of vitmutn C concentrates.

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