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Effect of blanching methods on proximate composition of sweet corn kernels before and after frozen storage

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Abstract
The study conducted at the Department of Food Science and Technology, College of Agriculture, JNKVV, Jabalpur, and Bhanu Farm ltd. Jabalpur, aimed to assess various sweet corn varieties for their suitability in the frozen food industry and subsequent product development. Six sweet corn varieties were collected from different regions in Madhya Pradesh. The investigation involved blanching methods (hot water and steam) with varying durations, followed by air blast freezing. The study analyzed the composition of sweet corn fresh kernels, before (blanched) and after freezing, revealing significant differences between different varieties. However, no significant impact was observed on moisture content after storage. The study also examined the interaction among various factors, including varieties, blanching method and blanching time period. The Rosy variety had the highest ash content (1.18%), followed by KSCH 972 and Sugar 75. The carbohydrate content was highest in Sweet 1 (20.40%), followed by Rosy (19.79%) and Sweet Heart (19.70%), while KSCH 972 had the lowest carbohydrate content during fresh condition.

Keywords: Frozen, blanching, carbohydrate, moisture, protein and proximate

Introduction
Sweet corn belongs to the Gramineae family, which also includes barley, wheat, and rice. This genetically modified grass originates from the tropical regions of the Americas. Historical records indicate that sweet corn may be traced back to 1779, when a participant of the Sullivuan expedition against the six countries returned with a small number of sweet corn ears, known as papoon corn. Maize, scientifically known as *Zea mays* L, is a very flexible crop that can thrive in a broad range of agricultural environments.

The sweet corn is farmed all over the globe as one of the adaptable and necessary crops. Sweet corn is often used in its fresh, tinned, and frozen states. Vigneault *et al.*, 2004 [3]. Higher respiration rate of sweet corn during storage, even at 0-10ºC, renders it perishable owing to short shelf life. Sweetness and softness are two crucial properties present in fresh and processed sweet corn, which are particularly significant throughout storage Azanza *et al.*, 1994 [4]. The enzymatic response in sweet corn is often chargeable for undesirable alterations by losing original flavor, fragrance, color, texture and taste after storage. The blanching performs a critical function by inactivating enzymes and slows down the response rate of harmful alterations. Blanching offers advantage of prolonged shelf life along with additional advantages of surface cleanliness, color persistence and preservation of vitamins. The increase of product quality by blanching with hot water and steam, prior to processing, is well demonstrated De-Corcuera *et al.*, 2004 [6]. The blanching also minimizes microbial burden during intermediate processing and lower temperature storages and inhibits reduction of vitamins in dried goods too. Hot water blanching is typical way to prevent post-harvest losses in fruits and vegetable, however the temperature and processing time generally have notable influence on color, look and eating of items Lam *et al.*, 1982 [8]. Hot water blanching has various advantages as it may delay the maturation and reduce the appearance of insects. Heating may be employed either by providing dry hot air or immersion in hot water Brecht *et al.*, 2004 [7]. The add on of applying hot water blanching is to manage the infections and stays financially efficient being cheaper in investment McGuire *et al.*, 2004 [13].

The impact of several blanching techniques on sweet corn *viz*., microwave, steam and hot water blanching with regard to varied time duration was detailed by Kachhadiya *et al*., 2018 [10]. However, influence of temperature level in hot water blanching was not recorded before, which is a key contributing component and fundamentally required to standardize the process parameters to get proper blanching to understand the effect on physical, chemical and sensory qualities. Therefore, the research was carried out to evaluate the influence of hot water blanching at different temperature levels for suitable time on enzymatic activity, physico-chemical characteristics of sweet corn kernels.

In Madhya Pradesh total area under maize crop 1,43,4282 hectares with production 43,13,998 metric ton and average productivity is about 3008 kg/h. There is almost all the district of MP grow maize crop but chhindwara is leading in terms of cultivated area (3,68,200 h) and production (14,18,675 ton) and Barwani in terms of productivity is leading with 5648 kg/h. (https://mpkrishi.mp.gov.in/hindisite_New/pdfs/201920_n.pdf)

Materials and Methods

The present investigation entitled, "Effect of Blanching Methods on Proximate Composition of Sweet Corn Kernels Before and After Frozen Storage" was conducted in the Department of Food Science and Technology, College of Agriculture, JNKVV, Jabalpur (M.P.) and Bhanu Farm Ltd., Jabalpur, (M.P.) during the year 2020-22. Six sweet corn varieties *viz*., Sugar 75, Sweet 1, KSCH 972, Rosy, Golden Cob and Sweet Heart were collected in fresh and mature state from AICRP on Maize, Zonal Agriculture Research Station, Chhindwara, JNKVV, Jabalpur and other regions of Chhindwara district, M.P.

Blanching of Sweet Corn

In current inquiry two sorts of blanching procedures have been employed for blanching of cleaned and shelled kernels as hot water (90 ºC) and steam (100 ºC) for three distinct time duration. Hot water blanching was done in stainless steel utensil and then cool via cold water while steam blanching was done in perforated stainless steel utensil over steam boiling water when appropriate temperature attained for certain period. After blanching, blanched kernels were applied to air blast freezing into Individual Quick Frozen for stop the complete chemical and enzymatic activity and further store for frozen temperature at -18 ºC. Preliminary studies were performed for the purpose of identifying the appropriate temperature with combination of different time range for inactivation of enzymatic activity of the kernels and accordingly different varieties kernels were blanched and by hot water and steam and applied air blast freezer. Different time-temperature combination was developed by study of enzymatic activity (peroxidase), sensory and total soluble solids. Various acceptability features such as color & appearance, taste, aroma, texture and general acceptability were examined as determining criteria by applying the approach given by (Amerine *et al*. 1965) [1].

Proximate analysis

Different parameters under proximate composition were analyzed according to standard methods of AOAC, 2019 [2].

Statistical analysis: The data obtained from various experiments were statistically analyzed. A factorial complete randomized design (FCRD) was adopted for statistical analysis of data by following the procedure as described by Panse and Sukhatme (1963) [14].

Results and Discussions

Proximate composition of sweet corn varieties

The proximate composition including moisture, protein, fat, fibre, ash, and carbohydrates of fresh sweet corn kernels as well as before and after frozen storage were determined and the results are presented in the table 1.

Proximate composition of different sweet corn varieties (Fresh)

An appraisal of the table 1 clearly indicated that the selected varieties of sweet corn differed significantly with each other in respect to moisture, protein, fat, fibre, ash and carbohydrate content. Moisture content (%) is observed from table 1 that the variety labelled as KSCH 972 demonstrated the highest moisture content (74.4%) and statistically at par with the Sugar 75, Sweet Heart, and Golden Cob. While, the variety denoted as Sweet 1 exhibited the lowest moisture content (69.09%) among the fresh sweet corn varieties. Protein content (%) in fresh corn, Sweet Heart demonstrated the highest protein content (5.26%) among the assessed varieties and at par with Sugar 75, Sweet 1, and Golden Cob. Whereas, the lowest protein content (4.05%) was observed in the Rosy variety. Fat content (%) in fresh corn kernels, KSCH 972 recorded the highest fat content (1.87%) and at par with Sweet 1, Rosy and Golden Cob, whereas Sweet Heart showed the lowest fat content (1.27%) among the assessed varieties. Fibre content revealed that the variety Sweet Heart reported the highest moisture content (3.5%) and at par with the Sweet 1 (3.43%). While, the variety denoted as Rosy exhibited the lowest fibre content (3.02%) as indicated in the table 1. Ash content showed that the, Rosy variety demonstrated the highest ash content (1.23%) in fresh corn among the assessed varieties and the lowest ash content (0.99%) was observed in the Golden Cob variety. Carbohydrate content in fresh sweet corn, Sweet 1 recorded the highest carbohydrate content (20.04%) and at par with Sugar 75 (19.64%), whereas KSCH 972 showed the lowest carbohydrate content (14.36%).

Moisture content (%) in different sweet corn varieties before frozen storage

In the assessment of moisture content of blanched sweet corn varieties before frozen storage, variety KSCH 972 exhibited the highest moisture content (75.37%) and statistically at par with Sugar 75, Sweet Heart, and Golden Cob, while Sweet 1 revealed the lowest moisture content (69.64%) among the frozen corn varieties as shown in table 1 The significant impact of blanching method on different sweet corn varieties was seen as the hot water blanching exhibited the maximum moisture content (72.64%), while the steam blanching method showed minimum moisture content (71.75%). Data showed non-significant influence on the different varieties of sweet corn with respect to moisture content before storage.

Interaction between various factors

The interaction between varieties and blanching method, between varieties and blanching time period, between blanching method and blanching time period and between varieties, blanching temperature and blanching time period were found to be non-significant with respect to moisture content of sweet corn kernels of different varieties before frozen storage.

Moisture content (%) in different sweet corn varieties after frozen storage

Table 1 revealed significant variations in the moisture content of various sweet corn varieties after frozen storage. Variety KSCH 972 exhibited the highest moisture content (74.38%) and statistically at par with Sugar 75, Rosy, Golden Cob, and Sweet Heart, while Sweet 1 revealed the lowest moisture content (68.92%) among the frozen corn varieties as shown in table 1. The significant impact of blanching method on varieties was seen as the hot water blanching exhibited the maximum moisture content (69.96%), while the steam blanching showed minimum moisture content (68.66%). No significant impact was seen on the different varieties of sweet corn with respect to moisture content after storage.

Interaction between various factors

The interaction between varieties and blanching method, between varieties and blanching time period, between blanching method and blanching time period and between varieties, blanching temperature and blanching time period were found to be non-significant with respect to moisture content of sweet corn kernels of different varieties after frozen storage. Similar result revealed by Szymanek *et al*., (2020) [12], Kachhadiya *et al*. (2018) [10] and Grzeszczuk *et al*., (2007) [5]. Significant differences were also observed in the protein, fat, ash and carbohydrate content in grits and flour as shown in the studies by Shevkani *et al*., (2014) [11] who reported the composition of protein, fat and ash to be higher in grits compared to the flour which was attributed to the particle size or fractions during dry milling.

Fibre content (%) in different sweet corn varieties before frozen storage

In the assessment of fibre content of sweet corn kernels of different varieties before frozen storage, variety Sweet Heart exhibited the highest fibre content (3.42%) followed by Sweet 1 (3.38%) and Golden Cob (3.12%), while KSCH 972 revealed the lowest fibre content (2.85%) among the frozen corn varieties as shown in table 1 There was significant impact of blanching method on varieties as the hot water blanching exhibited the maximum fibre content (3.16%), while the steam blanching showed minimum fibre content (3.08%). Similarly there was significant impact on the varieties with respect to different blanching time as 2 minutes exhibited the maximum fibre content (3.16%), while 4 minutes blanching time showed minimum fibre content (3.09%) before frozen storage.

Interaction between various factors

As evident from table 1 the interaction between varieties and blanching method, between varieties and blanching time period, between blanching method and blanching time period and between varieties, blanching temperature and blanching time period were found to be non-significant with respect to fibre content of sweet corn kernels of different varieties before frozen storage.

Fibre content (%) in different sweet corn varieties after frozen storage

The investigation into the fibre content of various sweet corn varieties after frozen storage revealed significant differences. Variety Sweet Heart exhibited the highest fibre content (3.84%) followed by Sweet 1 (3.66%) and Golden Cob (3.42%), while KSCH 972 revealed the lowest fibre content (2.91%) among the frozen corn varieties as shown in table 1 The significant impact of blanching method on varieties was seen, as the hot water blanching exhibited the maximum fibre content (3.88%), while the steam blanching method showed minimum fibre content (3.80%). Similarly, there was significant impact on the varieties with respect to different blanching time as 2 minutes blanching time exhibited the maximum fibre content (3.43%), while 4 minutes blanching time showed minimum fibre content (3.37%) after frozen storage.

Interaction between various factors

The interaction between varieties and blanching method, between varieties and blanching time period, between blanching method and blanching time period and between varieties, blanching temperature and blanching time period were found to be non-significant with respect to fibre content of sweet corn kernels of different varieties after frozen storage. Similar result revealed by Szymanek *et al*., (2020) [12], Kachhadiya *et al*. (2018) [10] and Grzeszczuk *et al*., (2007) [5]. Significant differences were also observed in the protein, fat, ash and carbohydrate content in grits and flour as shown in the studies by Shevkani *et al*., (2014) [11] who reported the composition of protein, fat and ash to be higher in grits compared to the flour which was attributed to the particle size or fractions during dry milling.

Ash content (%) in different sweet corn varieties before frozen storage

In the assessment of ash content of sweet corn kernels before frozen storage, variety Rosy exhibited the highest ash content (1.21%) followed by KSCH 972 (1.12%) and Sugar 75 (1.09), while Golden Cob revealed the lowest ash content (0.91%) among the frozen corn varieties as shown in table 1 The significant impact of blanching method on varieties was seen, as hot water blanching method exhibited the maximum ash content (1.08%), while the steam blanching showed minimum ash content (1.07%). Similarly, there was significant impact on the varieties with respect to different blanching time as 2 minutes blanching time reported the maximum ash content (1.09%), while 3 minutes and 4 minutes blanching time reported minimum ash content (1.07%) before frozen storage.

Interaction between various factors

It is clear from the table 1 that, the interaction between varieties and blanching method was found to be significant with respect to ash content of sweet corn kernels before frozen storage. The ash content ranged from 0.88% in varieties Golden Cob blanched in hot water to 1.22% in Rosy blanched with steam. The interaction between varieties and blanching time was found to be non-significant with respect to ash content of sweet corn kernels before frozen storage. The interaction between blanching method and blanching time as well as the interaction between varieties, blanching temperature and blanching time were found to be non-significant with respect to ash content of corn before frozen storage.

Ash content (%) in different sweet corn varieties after frozen storage

As evident from table 1 variety Rosy exhibited the highest ash content (1.15%) followed by KSCH 972 (1.07%) and Sugar 75 (1.06%), while Golden Cob revealed the lowest ash content (0.88%) among the frozen sweet corn varieties. The significant impact of blanching method on varieties was seen, as hot water blanching method resulted in maximum ash content (1.02%), while the steam blanching method resulted in minimum ash content (0.99%). Similarly, there was significant impact on the varieties with respect to different blanching time as 2 minutes blanching time exhibited the maximum ash content (1.04%), while the 4 minutes blanching time showed minimum ash content (1.00%).

Interaction between various factors

The interaction between varieties and blanching method was found to be significant with respect to ash content of sweet corn varieties after frozen storage. Maximum ash content (1.18%) was observed in the variety Rosy blanched in steam followed by Rosy blanched in hot water (1.12%) and KSCH 972 blanched in steam (1.07%), while minimum ash content was observed in the variety Golden Cob blanched in hot water (0.85%). The interaction between varieties and blanching time, between blanching temperature and blanching time and between varieties, blanching temperature and blanching time, were found to be non-significant with respect to ash content of sweet corn after frozen storage. Similar result revealed by Szymanek *et al*., (2020) [12], Kachhadiya *et al*. (2018) [10] and Grzeszczuk *et al*., (2007) [5]. Significant differences were also observed in the protein, fat, ash and carbohydrate content in grits and flour as shown in the studies by Shevkani *et al*., (2014) [11] who reported the composition of protein, fat and ash to be higher in grits compared to the flour which was attributed to the particle size or fractions during dry milling.

Carbohydrate content (%) in different sweet corn varieties (Fresh)

In the estimation of carbohydrate content in fresh sweet corn kernels, Sweet 1 recorded the highest carbohydrate content (20.04%) at par with Sugar 75 (19.64%), whereas KSCH 972 showed the lowest carbohydrate content (14.36%) among the assessed varieties.

Carbohydrate content (%) in different sweet corn varieties before frozen storage: In the evaluation of carbohydrate content of sweet corn kernels before frozen storage, variety Sweet 1 exhibited the highest carbohydrate content (19.69%) followed by Sugar 75 (18.73%) and Sweet Heart (18.12%), while KSCH 972 revealed the lowest carbohydrate content (13.67%) among the different varieties as shown in table 1 Significant impact of blanching method on varieties was seen as the hot water blanching exhibited the maximum carbohydrate content (17.81%), while the steam blanching method reported the minimum carbohydrate content (17.08%). Similarly, there was significant impact on the varieties with respect to different blanching time as 2 minutes blanching time exhibited the maximum carbohydrate content (17.59%), while 4 minutes blanching time showed minimum carbohydrate content (17.30%).

Interaction between various factors

The interaction between varieties and blanching method was found to be significant with respect to carbohydrate content of different sweet corn varieties after frozen storage. The carbohydrate content ranged from KSCH 972 blanched in hot water (13.21%) to Sweet 1 blanched in steam (19.85%) at par with Sweet 1 blanched in hot water (19.52%). The interaction between varieties and blanching time was found to be non-significant with respect to carbohydrate content of sweet corn before frozen storage. The interaction between blanching temperature and blanching time period was found to be significant with respect to carbohydrate content of sweet corn before frozen storage. Maximum carbohydrate content (1.61%) was observed in the steam blanching for 2 minutes and at par with steam blanching for 3 minutes, while the minimum carbohydrate content (1.48%) was observed in the hot water blanching method for 4 minutes. The interaction between varieties, blanching temperature and blanching time period was found to be non-significant with respect to carbohydrate content of sweet corn before frozen storage.

Table 1: Proximate composition (%) of different sweet corn varieties before and after frozen storage

Treatments	Moisture			Protein			Fat			Fibre			Ash			Carbohydrate		
	Fresh	Before	After	Fresh	Before	After	Fresh	Before	After	Fresh	Before	After	Fresh	Before	After	Fresh	Before	After
	Factor 1: Varieties																	
Sugar 75 (V1)	70.02	71.14	70.11	4.40	4.32	4.23	1.75	1.70	1.64	3.08	3.03	3.30	1.11	1.09	1.06	19.64	18.73	19.65
Sweet 1 (V2)	69.09	69.64	68.92	4.77	4.70	4.62	1.60	1.55	1.44	3.43	3.38	3.66	1.07	1.04	0.95	20.04	19.69	20.40
KSCH 972 (V3)	74.40	75.37	74.38	5.23	5.15	5.03	1.87	1.83	1.75	2.94	2.85	2.91	1.17	1.12	1.07	14.36	13.67	14.85
Rosy (V4)	71.62	72.14	70.36	4.05	3.94	3.84	1.73	1.67	1.60	3.02	2.94	3.26	1.23	1.21	1.15	18.35	18.01	19.79
Golden Cob (V5)	73.26	73.93	72.33	4.20	4.12	4.03	1.50	1.43	1.39	3.20	3.12	3.42	0.99	0.91	0.88	16.85	16.44	17.96
Sweet Heart (V6)	70.08	70.95	69.31	5.26	5.15	5.02	1.27	1.21	1.13	3.50	3.42	3.84	1.09	1.07	1.00	18.80	18.12	19.70
SEM	1.03	0.44	0.47	0.07	0.03	0.03	0.03	0.008	0.007	0.04	0.018	0.020	0.015	0.006	0.007	0.317	0.115	0.114
CD @ 5%	3.18	1.23	1.32	0.22	0.08	0.08	0.09	0.023	0.02	0.12	0.050	0.057	0.047	0.018	0.018	0.977	0.324	0.323
	Factor 2: Blanching methods																	
Hot water 90ºC (B1)		72.64	69.96		4.52	4.96		1.53	1.08		3.08	3.80		1.07	0.99		17.08	19.20
Steam 100ºC (B2)		71.75	68.66		4.61	5.08		1.60	1.17		3.16	3.88		1.08	1.02		17.81	20.20
SEM		0.25	0.27		0.02	0.02		0.005	0.004		0.01	0.012		0.004	0.004		0.066	0.066
CD @ 5%		0.71	0.76		0.05	0.04		0.013	0.012		0.029	0.033		0.01	0.011		0.187	0.186
	Factor 3: Blanching time																	
2 Minutes (T1)		71.97	70.59		4.61	4.51		1.59	1.51		3.16	3.43		1.09	1.04		17.59	18.90
3 Minutes (T2)		72.22	70.86		4.56	4.47		1.57	1.49		3.12	3.40		1.07	1.02		17.44	18.76
4 Minutes (T3)		72.40	71.24		4.52	4.41		1.53	1.46		3.09	3.37		1.07	1.00		17.30	18.51
SEM		0.31	0.33		0.02	0.019		0.006	0.005		0.013	0.014		0.004	0.005		0.081	0.081
CD @ 5%		N/A	N/A		0.06	0.054		0.02	0.01		0.036	0.04		0.013	0.013		0.229	0.228
	Interaction: Varieties X Blanching methods																	
V1B1		71.92	70.75		4.26	4.18		1.67	1.60		2.99	3.29		1.09	1.06		18.08	19.12
V1B2		70.36	69.48		4.37	4.28		1.74	1.68		3.07	3.32		1.10	1.06		19.37	20.18
V2B1		69.88	69.23		4.67	4.59		1.52	1.42		3.35	3.63		1.04	0.97		19.52	20.16
V2B2		69.40	68.62		4.73	4.66		1.57	1.46		3.41	3.68		1.04	0.94		19.85	20.64

V3B1		75.89	74.82		5.12	4.99		1.81	1.76		2.79	2.85		1.12	1.08		13.21	14.52
V3B2		74.84	73.94		5.18	5.08		1.86	1.75		2.90	2.97		1.13	1.07		14.12	15.19
V4B1		72.33	70.75		3.89	3.78		1.64	1.57		2.91	3.19		1.21	1.12		17.87	19.59
V4B2		71.96	69.96		3.99	3.90		1.70	1.63		2.98	3.33		1.22	1.18		18.15	19.99
V5B1		74.25	72.81		4.08	4.00		1.39	1.34		3.08	3.35		0.88	0.85		16.21	17.64
V5B2		73.61	71.84		4.15	4.06		1.46	1.43		3.17	3.49		0.95	0.90		16.67	18.28
V6B1		71.56	69.96		5.09	4.96		1.17	1.08		3.37	3.80		1.06	0.99		17.58	19.20
V6B2		70.34	68.66		5.21	5.08		1.25	1.17		3.46	3.88		1.07	1.02		18.66	20.20
SEM		0.62	0.66		0.04	0.04		0.01	0.01		0.025	0.028		0.009	0.009		0.163	0.162
CD @ 5%		N/A	N/A		N/A	N/A		N/A	0.029		N/A	N/A		0.025	0.026		0.459	N/A
	Interaction Varieties X Blanching time																	
SEM		0.75	0.81		0.05	0.05		0.01	0.01		0.031	0.035		0.011	0.011		0.199	0.198
CD @ 5%		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A
	Interaction Blanching methods X blanching time																	
SEM		0.43	0.46		0.02	0.02		0.008	0.007		0.018	0.02		0.006	0.007		0.115	0.114
CD @ 5%		N/A	N/A		N/A	N/A		0.023	N/A		N/A	N/A		N/A	N/A		N/A	N/A
	Interaction Varieties Xblanching methods X Blanching time																	
SEM		1.06	1.14		0.07	0.06		0.02	0.01		0.044	0.049		0.015	0.016		0.282	0.28
CD @ 5%		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A		N/A	N/A

V – Variety, B – Blanching method, T – Blanching time

Carbohydrate content (%) in different sweet corn varieties after frozen storage

In the assessment of carbohydrate content of corn after freezing, variety Sweet 1 (20.40%) exhibits the highest carbohydrate content followed by Rosy (19.79%) and Sweet Heart (19.70%), while KSCH 972 (14.85%) revealed the lowest carbohydrate content among the frozen corn varieties as shown in table 4.4. The significant impact of blanching temperature on varieties as the hot water blanching at 100°C exhibited the maximum carbohydrate content (20.20%), while the steam blanching at 90°C showed minimum carbohydrate content (19.20%). Whereas, the significant impact on the varieties of blanching temperature with respect of different time period as 2 minutes (blanching time) exhibited the maximum carbohydrate content (18.90%), while the 4 minutes (blanching time) showed minimum carbohydrate content (18.51%).

Interaction between various factors

The interaction between varieties and blanching method was found to be significant with respect of carbohydrate content of corn after frozen storage. Maximum carbohydrate content was observed in the variety KSCH 972 blanched in hot water (1.76%) followed by KSCH 972 blanched in steam (1.75%), Sugar 75 blanched in steam (1.68%) and Rosy blanched in steam (1.63%), while minimum carbohydrate content was observed in the variety Sweet Heart blanched in hot water (1.08%). The interaction between varieties and blanching time, between blanching method and blanching time as well as between varieties, blanching temperature and blanching time were found to be non-significant with respect to carbohydrate content of sweet corn after frozen storage.

Similar result revealed by Szymanek *et al*., (2020) [12], Kachhadiya *et al*. (2018) [10] and Grzeszczuk *et al*., (2007) [5]. Significant differences were also observed in the protein, fat, ash and carbohydrate content in grits and flour as shown in the studies by Shevkani *et al*., (2014) [11] who reported the composition of protein, fat and ash to be higher in grits compared to the flour which was attributed to the particle size or fractions during dry milling.

Conclusion

The Based on the extensive analysis of different sweet corn varieties before and after frozen storage, along with the effects of blanching methods and time periods, several conclusions can be drawn: Significant variations exist among different sweet corn varieties in terms of their proximate composition, including moisture, protein, fat, fiber, ash, and carbohydrate content. Each variety exhibited distinct nutritional profiles, showcasing differences in moisture, protein, fat, fiber, ash, and carbohydrate content both in their fresh state and after frozen storage. Blanching methods (such as hot water and steam) showcased significant impacts on the nutritional composition of sweet corn. Hot water blanching generally resulted in higher moisture and carbohydrate content compared to steam blanching, which typically showed lower values in these aspects. Blanching time periods also influenced the nutritional content, with varying effects depending on the duration of the blanching process. While frozen storage impacted the nutritional composition of sweet corn varieties to some extent, the differences observed before and after freezing were not always significant. The variations were more evident in moisture content, where certain varieties displayed differences after frozen storage. The interactions between different factors, such as varieties, blanching methods, blanching time periods, and temperatures, were found to be both significant and non-significant, indicating complex relationships affecting the nutritional content of sweet corn. In short this comprehensive analysis demonstrates the significant varietal differences in the proximate composition of sweet corn and the influence of blanching methods and storage on its nutritional attributes. Understanding these variations is crucial for consumers, food processors, and researchers aiming to optimize nutritional content and maintain quality in sweet corn varieties during processing and storage.

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