

Research Article

Changes and Contrast Analysis for Ingredients of Nutrient under Different Storage Environment

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Abstract: In order to explore the best environment conditions for storage nutrients. Average distributed the same batch nutrients samples which were placed into five groups environment respectively whom set different specific targets, specific indicators of each group environment including temperature, humidity, air velocity, light intensity. The nutrient samples were stored in each group environment after 14 days, detect the content of indicators whose include moisture, protein, fat, vitamins, minerals. In the storage environment whose has temperature of 18-20°C, humidity of 41-50%, the air flow velocity of 3.0 m/sec, the light intensity of 181-200 lx, moisture content of nutrients is the lowest, other ingredients content were the highest, nutrient ingredient were saved preferably. Stored the nutrients under appropriate environment conditions, in order to make it to meet the requirements of quality in longer time and avoid certain loss, which play a greater degree of benefit results.

Keywords: Change and contrast analysis, main ingredients, nutrients, storage environment

INTRODUCTION

Metabolism is the foundation of life phenomenon to maintain life (Ren *et al.*, 2006). Living organisms continuous absorbed nutrients from the environment to be conversion, absorption and utilization, releasing energies to supply the needs of life activities. Nutrient as a raw material, has an extremely important role in the growth, development, reproduction as well as participated in updates and repair of some organizational structure for living organisms (Peña *et al.*, 2009).

Active ingredients and proportions of nutrient for a long time stability is the key for work, however, in the process of storage and use, they will be changed due to affected by various factors, including environmental factors such as the temperature, humidity, air velocity, light intensity and so on which play the greatest influence on them (Peters and Brain, 2009).

In this study, the content of active ingredients including moisture, protein, fat, vitamins, minerals of nutrients in different environments were measured and analyzed in order to explore the best environmental conditions for storage nutrient.

MATERIALS AND METHODS

Materials: Nutrients come from wu han wan qian jia xing bio-technology Co. Ltd.

Instruments and reagents: TU-1901 UV-Vis spectrophotometer, Shimadzu HPLC-GL, KDN-103F

protein Azotometer, ZF-06B fat tester, MD6C-6H microwave digestion system, AG204 electronic scales, electric heated moisture bath, calorimeter, petroleum ether, ethanol, etc. Glasswares were soaked with 50% HNO overnight, ultra-pure moisture rinse spare.

Methods: In this study, set up five groups environment, each group environment specific set four indicators such as temperature, humidity, air velocity, illumination intensity. Corresponding specific indicators values of each group were different (Table 1). Average distributed the same batch nutrients samples which were placed into five groups environment respectively, the nutrient samples were stored in each group environment for 14 days, after then, detecting the content of indicators.

The moisture, protein, fat, vitamins, minerals detection methods according to the national standard method. Determination of moisture: according to GB/T 5009.3-2003 "Determination of moisture in foods", determination of protein: by micro Kjeldahl method, according to GB 5009.5 2010/XG1-2014 "national food safety standards determination of protein in food", the No. 1 national standard measurement standard amendments, determination of Fat: according to GB/T 5009.6-2003 "Determination of fat in foods"; determination of Vitamin C: according to GB/T 6195-1986, determination of Vitamin A: according to GB/T 5009.82-2003; determination of Vitamin B: according to GB/T 5009.84-2003; determination of mineral

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Table 1: Different specific index values in different environments

	Temperature (°C)	Humidity (%)	Airflow velocity (m/sec)	Light intensity (lx)
The first group environment	12-14	21-30	2.0	141-160
The second group environment	15-17	31-40	2.5	161-180
The third group environment	18-20	41-50	3.0	181-200
The fourth group environment	21-23	51-60	3.5	201-220
The fifth group environment	24-26	61-70	4.0	221-240

Table 2: Changes of main ingredients of nutrients in different environment

Ingredients	Environment				
	First group	Second group	Third group	Fourth group	Fifth group
	Content				
Moisture (g/100 g)	6.41	5.39	5.27	3.55	3.02
Protein (mg/100 g)	21.15	22.63	23.17	15.43	14.11
Fat (g/100 g)	19.27	22.45	23.03	15.51	13.62
Vitc (ug/100 g)	88.61	88.59	88.67	70.57	68.81
Vita (ug/100 g)	79.45	78.82	80.53	65.38	63.55
Vitb (ug/100 g)	80.34	79.45	81.12	64.25	61.09
Ca (mg/100 g)	198.47	210.53	211.26	160.71	158.42
K (mg/100 g)	695.53	702.97	707.61	602.17	598.79
Na (mg/100 g)	87.31	88.52	88.29	69.43	66.84

elements such as calcium, potassium, sodium: according to NY/T1653-2008.

Detection methods and processes were carried out in accordance with operation and reagent instructions.

Repeat the measurement three times and obtained an average value and the absolute difference between of each independent determination result is no more than 10% of the average value.

Data processing: Using SPSS 13.0 software for statistical analysis of the obtained data, with $p < 0.05$ was considered statistically significant and $p < 0.01$ as statistically significant difference.

RESULTS AND DISCUSSION

All the major ingredients of nutrient in different environment changed results shown in Table 2: In the first, second and third group environment, the main ingredients have occurred in varying degrees of change, horizontal comparison content of each component was no significant difference ($p > 0.05$). In the fourth, fifth group environment, the main ingredients have occurred in varying degrees of change, horizontal comparison content of each component was no significant difference ($p > 0.05$). In the third group environment, moisture content of nutrients is the lowest, other ingredient content were the highest, nutrient ingredient were saved preferably. The fourth, fifth group environment compared with the third group environment, the main ingredients content of nutrient have significantly different ($p < 0.01$).

Stored the nutrients under appropriate environment conditions, in order to make it to meet the requirements of quality in longer time and avoid certain loss, which play a greater degree of benefit results. In this regard, set up environment indicators to stored the nutrients

generally from the following aspects (Miranda *et al.*, 2011):

- Control the temperature, low temperature allows the active ingredients of nutrient in the dormant state, microbial activity were restricted, toxigenic and fungal reproduction were effectively controlled, reduced physiological changes of nutrient, ensure the storage quality (Li and Liu, 2012).
- Moisture is the necessary condition for enzymatic reactions when nutrient physiological activities, controlling the relative humidity in the storage environment within safe moisture range, so that the mold cannot breed, which is an important measure for safe storage and ensure the quality of nutrient (Azene *et al.*, 2014).
- Storage is the foundation of nutrient having air permeability and voids between of them, proper air flow speed can be reduced nutrient temperature, distributed excess moisture, in order to facilitate safe storage nutrient; at the same time do not make too much moisture loss (Sahoo *et al.*, 2014).
- Appropriate light intensity allows the molecular structure of the active component of nutrients are not be destroyed which in order to protect its quality (Chong *et al.*, 2013).

CONCLUSION

In the third group environment, moisture content of nutrients is the lowest, other ingredients such as protein, fat, VitC, VitA, VitB, Ca, K, Na content of nutrient were the highest, which shown that in the environment whose has temperature of 18-20°C, humidity of 41-50%, the air flow velocity of 3.0 m/sec, the light

intensity of 181-200 lx is the best environment for storage of nutrients.

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