IJBPAS, November, 2020, 9(11): 3033-3054

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

FUTURISTIC SOLUTION FOR NUTRITIONAL SECURITY-AN OUTLOOK OF NUTRI-CEREALS

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Received 22nd March 2020; Revised 24th April 2020; Accepted 17th May 2020; Available online 1st Nov. 2020

https://doi.org/10.31032/IJBPAS/2020/9.11.5261

ABSTRACT

In the developing countries Agriculture sustainability with nutritional security is the big challenge for everyone. Agriculture lands are exploited due to changing of climatic condition gradually. It is very difficult to maintain quality grain with full of nutrition by daily crop production practices. This situation is also a big challenge by Agro scientists to provide nutritious grains in low fertile soil with less rainfall. Millets are the highly climatic change crops with full of nutrition replaces Wheat and Rice. Millets are the staple food that used for people from semi-arid region. These are the crops grows in those areas which receive subtracting rainfall. They are mostly produced in Asia and Africa continents. Asian countries like India and Nepal, and African countries like Nigeria, Sudan and Niger are the biggest producer of millets. These 'Nutri-cereals' contents all the major and micronutrients. It is rich in minerals and vitamins, which protect us from diabetes, heart disease, under nutrition, CVD and cancer. It has nutraceuticals properties which prevent us from many degenerative diseases. Millets are very low in cost and they have several health benefits, just because of this it is known as 'Food for all'. Cultivation of millets can increase the productivity of dry land and ensures its future perspective in nutritional security.

Keywords: Millet, Nutri-cereals, Nutraceuticals, Minerals, Under-nutrition

1.INTRODUCTION

Millets are the native of India and very popular grain also knows as 'Nutri Cereals'. In the field of Agriculture modern technologies and progressive scientific knowledge have promoted better life style ok mankind. In Agriculture selection and development of good quality seeds, technology innovation, organic fertilizers processing, and improvement of irrigation facilities and use of pesticides have proven the availability of food has been increased. If we measure the estimated cereal production in 2016 and 2017 were 2605 million and 2597 million respectively in world **[1]**. Due to change the climatic condition production of crops are declining by farmers. In many developing countries just because of dry land, subtracting rainfall and low fertile soil lowering the crop production rate day by day **[2]**. According to World Bank hunger is a big challenge worldwide. In the present scenario around 815 million people are suffering with hunger and undernourishment **[3]**. India is an agriculture domain country in spite of this farmer's suicide rates are high on average 52-54 deaths/day has been reached **[4]**.

Sustainability of low cost crops like millets are much needed for encounter the world hunger (Demand of food) and revenue growth of farmers **[5]**. There are mainly more than six types of millets cultivated in India and they are Pearl Millets (*Pennisetum glaucum*), Sorghum (*Sorghum bicolor*), Finger Millets (*Eleusine coracana*), Proso millets (*Panicum miliaceum*), Foxtail millet (*Setaria italic* L), Barnyard millet (*Echinochloa*) and Kodo millet (*Paspalum scrobiculatum*) **[6]**. Millets are the robust plants able to growing in those areas which experience subtracting rainfall**.** These have been grown in Indian sub continent and Africa **[8]**. These are the oldest crops grows in southern and northern parts of Africa and Asia in around 1500 to 2000BC **[7]**. Pearl millets and Finger millets are mostly grows in northeastern part of Nigeria and southwestern part of India. These are the main food source for local villagers of that region. These crops required harsh weather condition such that draught and minimum rainfall. These are long storage grains. In the present global scenario peoples are facing so many health related problems, just because of less immunity power. In that condition Pearl millets and Finger millets are the natural gift from agriculture domains. They are the rich sources of Macronutrients, Micronutrients and Nutraceuticals. Which lessen the risk of Heart disease, Diabetes, CVD, CHD, Cancer and also Malnutrition and Undernourishment.

Apart from these millets, there are mainly two types of millets produced in Asia and Africa. And these are Maize and little millets. These are a pocket friendly grain that's why it is called 'Food for all' **[8]**.

The above **Figure 1** shows that there are so many perspectives of millets. It increased food safety and security by reduced the climatic stress because it grows in dry or semi-arid region. The second perspective is that it is rich in nutrients and phenolic compounds which fulfill daily nutritional requirement. The third perspective is that they protect from many diseases as they are Gluten-free which is useful in celiac disease, rich in antioxidants and low GI level prevent from heart disease and diabetes. The fourth perspective is these are very profitable and economically very cheap in prize, and low investment crop so farmers can earn more than others **[9]**. India is the first largest producer of Pearl millets and Africa is the second largest producer of Millets. Millets grows in those areas which experience subtracting rainfall **[10]**. In India it grows in Maharashtra, Madhya Pradesh, Gujarat, Rajasthan, Haryana and Karnataka on large scale. These millets are known by their different names in different states. The common Hindi names are Bajra (Pearl millet), Jowar (Sorghum), Ragi (Finger millet) and Mucca (Maize) **[11]**. The vernacular name table for different millets in different states of India is shown in **Table 1**.

1.2-Availability and Nutritional Sustainability of Millets-

Millets are the influential byproduct of Africa and Asia (India, Nigeria and Niger). India is the first largest producer of Pearl millets and Africa is the second largest producer of Millets. Millets grows in those areas which experience subtracting rainfall. In India it grows in Maharashtra, Madhya Pradesh, Gujarat, Rajasthan, Haryana and Karnataka on large scale **[13]**.

While 'Food and Agriculture Organization' (FAO) and WHO attempting to fill the scarcity of food storage by trying to provide jointly, low-priced food sources to stop the chances of undernourishment in straitened peoples. Seeing the same thing millets are the most fortunately grain which we are adding in our research because it is low-priced and high nutritional value. Government of India is promoting millet farming by using advanced techniques **[14]**. Due to this intellect FAO has been started great production of millets in India. According to World Food Program the production of millets increased from 32 million tons in 1996-99 to 42 million tons in 2015-18. Showing increase of 31.25 % **[15]**.

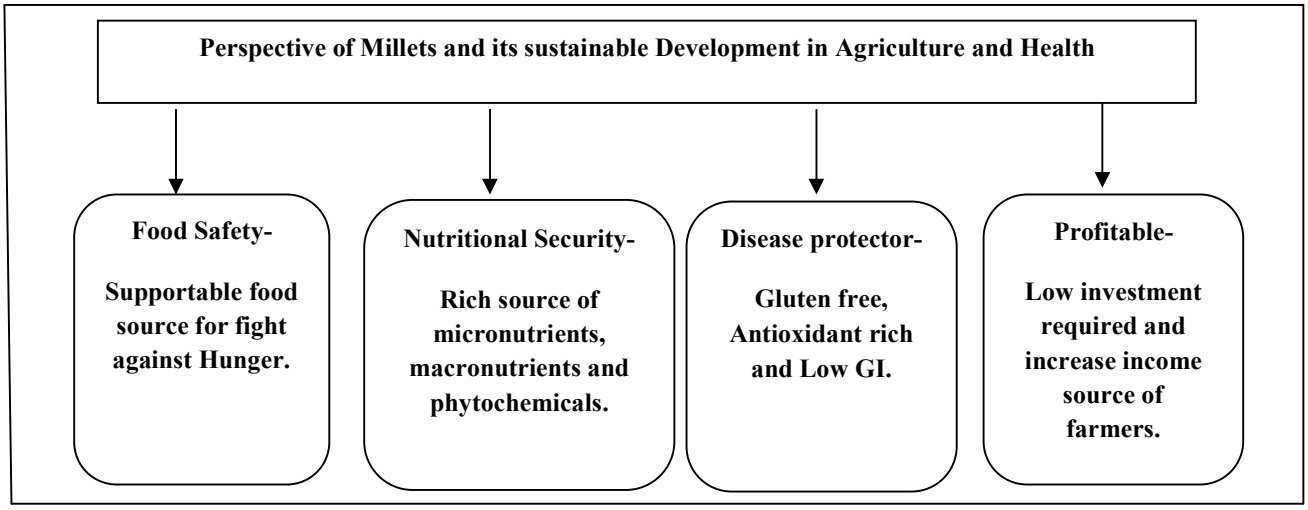

Figure 1: Benefits of Millets
Source: - Saleh ASM et al, 2013, Millet grain: Nutritional quality, processing and potential health benefits. (Journal of food science and food safety) [8]

Table 1: Vernacular Name Table of Different Millets from Different States of India

English	Hindi	Marat-hi	Kanna-da	Telugu	Tamil	Bengali	Gujrati	Oriya	Punjabi
Sorghum	Jowari	Jwari	Jola	Jonna	Cholam	Jowar	Jowari	Juara	jwar
Pearl millet	Bajra	Bajri	Sajje	Sajja	Kambu	Bajra	Bajri	Bajra	Bajra
Finger millet	Ragi	Nachni	Ragi	Ragulu	Keppai	Marwa	Nagli	Mandia	Mandhuka
Foxtail millet	Kakum	Kang	Navane	Korra	Thenai	Kaon	Kang	Kanghu	Kangani
Little millet	Kutki	Sava	Same	Samalu	Samai	Sama	Gajro	Suan	Swank
Proso millet	Chena	Vari	Baragu	Variga	Pani Varugu	Cheena	Cheno	Bachari	Cheena
Kodo millet	Kodon	Kodra	Harka	Arikelu	Varagu	Kodo	Kodra	Kodua	Kodra
Barnyard millet	Sanwa	Bhagar	Oodalu	Udhalu	Kuthira-ivali	Shyama	-	Khira	Swank

Source: - ICAR project report on Small Millets (2018). [12]

1.3-Production and Farming Significance of Millets:-

As the world population increasing day by day just like that the demand of food is also increasing. About 50% of total calorie intake is acquired from cereals **[16]**. Wheat, Rice and Millets are the major staple cereals food for most of the people, as everyone aware that the ground water table is decreasing bit by bit, so in this crucial condition crop production of Wheat and Rice with proper irrigation is not possible. In this situation the cultivation of millets can be the only solution to emerge this problem. Because millets grows in semi-arid region with less rain fall, low fertile soil in normal acidic to basic medium with pH level between 4.5 to 8.0 **[17]**. Millets can be very nutritive alternative crop to Wheat and Rice. Rice has poor fertility in saline soil as it is very sensitive and may not grow properly. On the other hand Pearl millet and Finger millet grows very well in saline soil. They also required less water to grow **[18]**. Pearl millets and

finger millets grow in loamy and shallow soil. They both required 11-12ds/m soil salinity to grow up. For the cultivation of Pearl millets, Proso millets and Foxtail millets the essential rainfall required between 20-70 cm. whereas Finger millets needed 50-60 cm and Kodo and Little millets required 800-1200mm rainfall. Rice grows in acidic medium (pH 6.5-8.5) range. Pearl millets can grow up in6-70 days with 8.0 pH. Finger millets, Proso millets Foxtail millets and Barnyard millets grow in alkaline or base medium (pH 4.5-6.5). The maturity time for finger millets is 90-120 days which is more than other millets. Kodo millets and Rice takes more time to mature around 100-160 days, it is just double to Barnyard and Foxtail maturation time (45-70 days) **[19]**. The growing condition of different millets and its comparison with other staple foods like Wheat and Rice are tabulated in **Table 2**. Millets are under the C4 group cereals. C4 cereals are those cereals which release more oxygen to atmosphere in return of Carbon-di-oxide. Because of this phenomenal quality, millets also known as 'Environmental friendly cereals' **[20]**.

Millets are the influential by product of Africa and Asia (India, Nigeria and Niger). The first largest producer of pearl millet is India. During the years 2015-16 India was the major Pearl millet producer country (8.06 million tons). Indian states like Madhya Pradesh, Maharashtra, odisha, Karnataka, Gujarat and Rajasthan are the highly production of different types of millet. Africa is the second largest producer of Pearl millet. Sahel and Namibia are famous for production of different varieties of millets. This is the main source of food for local villagers in African countries. Millet is flourishing in northeastern region of Africa and semi arid region of India. Finger millet is the richest source of calcium. It originated in east Africa and its cultivation started in India around 2000BCE. Cultivation of finger millets, Foxtail millets and Sorghum are mainly in African countries like Kenya, Uganda, Zimbabwe, Sudan and Nigeria. And mostly in south Asian countries like India and Nepal. They are draught resistant and long time storage small grain **(Table 3) [22]**.

According to this data India is the largest producer of Millets. If we talk about the production of Millets and other staple grains like Wheat and Rice in India, so we see that the production rate of Rice increased 29% till 2005- 2019-20. The production rate of Wheat is also increased (55%). In Millets only Pearl millets has increased in production rate and that is 37% in the year of 2019-20. Rest of the millets production and cultivation rates

are not significant. Sorghum, Finger millet and other nutria grains have the decreasing rate of cultivation (**Table 4).** The only reason of this diverse condition is to change the climatic condition gradually.

In the field of Agriculture scientific intervention in the form of molecular biomarkers, population design by mapping have led to the development of high capitulating varieties of millets universally **[24, 25]**. Hybrid millets are in very developed form and disease resistance and its productions are increasingly per hector as comparatively their parent's variety. Advanced technology has developed several fold in millet variation, resulting approximately 140 species of pearl millets has been developed **[26-28]**. Millets cultivation and its consumption supplies a comprehensive solution to farming challenges and also proved that it is a milestone to prevent malnutrition or under nutrition in developing countries **[29, 30]**.

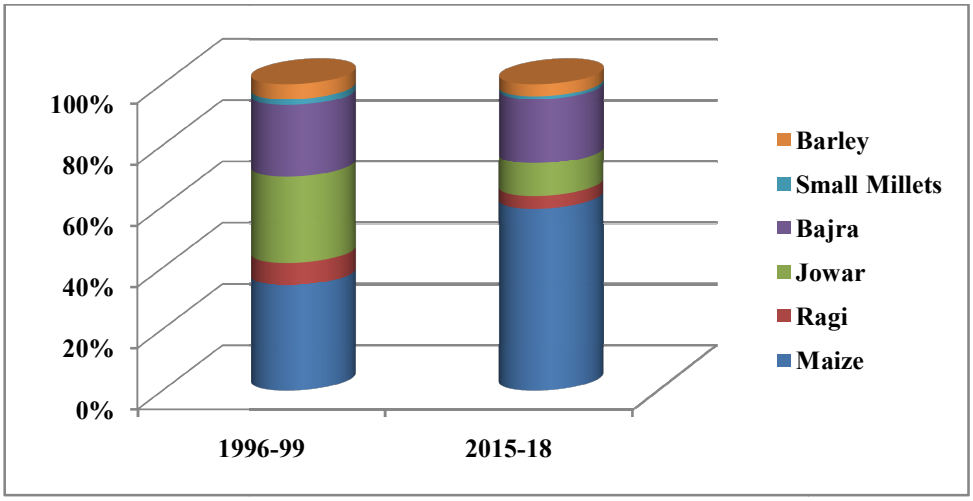

Figure 2: Availability of Millets Per Capita Growth Chart in India. (1996-99 and 2015-16)
Source: - Food and Nutrition Security Analysis, (World Food Program), India, 2019 [15]

Table 2: Growing conditions of Millets and Major Cereals

Crop	Optimum soil type	Temperature	pH	Soil Salinity (ds/m)	Required Rainfall	Maturity time (Days)
Rice	Heavy to Sandy loam	21-37˚C	6.5-8.5	Less than 3.0 ds/m	120-140 cm	100-160
Wheat	Light clay or heavy loam	1.3-35˚C average 15.5˚C	6.0-7.0	6.0 ds/m	30-100 cm	90-125
Sorghum	Clay loamy and Shallow soil	26-30˚C	5.0-8.0	4-6 ds/m	40-100 cm	90-120
Pearl millet	Loamy and Sallow soil, Soil with clay	30-34˚C and grow up to 46˚C	6.0-7.0	11-12 ds/m	20-60 cm	60-70
Finger millet	Rich loam to poor upland shallow soil	26-30˚C	4.5-7.5	11-12 ds/m	50-60 cm	90-120
Proso millet	Sandy loam, slightly acidic	20-30˚C	5.5-6.5	-	20-50 cm	60-90
Foxtail millet	Sandy to loamy soil	5-35˚C	5.5-7.0	6 ds/m	30-70 cm	75-90
Barnyard millet	Medium to heavy soil	15-33˚C	4.6-7.4	3-5 ds/m	-	45-70
Kodo millet	Fertile to marginal soils	25-27˚C	-	-	800-1200 mm	100-140
Little millet	-	-	-	-	-	80-85

Source:- Ashwani Kumar et al, Millets: a solution to agrarian and nutritional challenge, Agriculture and Food security, 2018 [21]

Table 3: The leading Millet Producing Countries in the World

Rank	Country	Production(Tones)
1	India	10,910,000
2	Nigeria	5,000,000
3	Niger	2,955,000
4	China	1,620,000
5	Mali	1,152,331
6	Burkina Faso	1,109,000
7	Sudan	1,090,000
8	Ethiopia	807,056
9	Chad	582,000
10	Senegal	572,155
11	World	29,870,058

Source: - Food and Agriculture Organization of United Nation: Economic and Social Department: The Statistical Division [12]

Table 4: Production of Food Grain in India (2005-2020) in Million Tons

Crop	2005-2008	2008-2012	2012-2016	2016-2019	2019-2020
Rice	91-96	99-105	105-104	109-116	117.94
Wheat	69.35-78.57	80.69-94.88	93.51-92.29	98.51-103	107.18
Sorghum	7.63-7.93	7.25-5.98	5.28-4.24	4.57-4.90	4.63
Pearl millet	7.68-9.97	8.89-10.28	8.74-8.07	9.73-8.66	10.31
Finger millet	2.35-2.15	2.04-1.93	1.57-1.82	1.39-1.24	1.69
Small millet	0.47-0.55	0.44-0.45	0.44-0.39	0.44-0.33	0.34
Nutri Cereals	18.14-20.60	18.62-18.64	16.03-14.52	16.12-13.71	16.97

Source: - Ministry of farmer's welfare, production of food grain, 2019-2020 [23]

1.4-Processing of millet: -

Processing of millets is the technology which converts it in edible form to enhance good nutritional quality. The techniques of Food processing improves the Bioavailability and digestibility of millets and also deficient its Anti-nutritional quality. Most common processing techniques are- Germination, Fermentation, Popping and Soaking. Germination is the process in which decreases of the level of tennis and reduction of phytic acids are very common. Due to germination most essential micronutrients like calcium, zinc and iron increase in pearl millet and finger millet. Germination also improves the content of niacin, thiamin and lysine. It also enhances fiber content and vitamin-c in millets **[31]**. Some ready to cook food products like sprout salad, cheela and vegetable can prepare with germinated millet seeds. Fermentation improves the quality of protein, ash, fiber and fat in pearl and finger millet. It upgrades the texture and flavor of food. But some minerals like sodium, potassium and zinc can reduced remarkably by this process **[32]**. Idli, Dosa and Jalebi are the famous fermented food products which can make by fermented millets. Popping is the process in which high temperature short time treatment used on millets to change its texture. By this process gelatinization and bursting of endosperm are occurs. This process takes very short time of period and also increase the aroma and flavor of food

[33]. Popcorn is the well known popped millets used by people. One of the processing technique of millet is soaking this is very popular household practice in which millets are soaked in water for 6-8 hours. It decreased the Anti-nutritional factors from millets and boosts the mineral availability and digestibility. By this process upgrades zinc and iron content in millets **[34]**. Soaking millets can used for multipurpose uses in daily cooking practices.

2. Nutritional Features of Millets

In this present scenario world is facing so many health related disorders. According to Global Nutrition report 2016, around 44% population from 129 countries is suffering with under nutrition as well as over nutrition **[42]**. The joint estimate of malnutrition by World Bank in 2020 is visible that prevalence of stunting has been fewer in the year 2000. Numbers of stunted children under five years in 2019 were 144 million, 47 million experienced from wasting globally. The amount of under-nutrition level in children is the footstep of growth process. "WHO" and "UNICEF" are stepping forward to achieve the bigger goal in the field of food security and sustainable development to stop death from hunger **[43]**. Guided by WHO the prevalence rate of malnutrition in India is 44% children up to 5 years of age are underweight, 52% women and 72% new born are anemic. In that condition the nutritional requirement for children in this poor state should be rich in high biological value protein (5 Gms per kg. per body weight), high in energy (200 kilo calories per kg. per body weight) and mineral supplements. But due to poor socioeconomic state of India the per capita availability of food is impoverished. This makes it awkward for wide-reaching population to fit nutritious food **[44]**. In India persons don't have sufficient wealth of which per capita groceries and storage of food is low in spite of high manufacturing or production **[45]**. Nutritional feature of any food is the chief framework for managing human health. In this order millets are full of nutritious basket with low price. These are abundant source of macronutrients and micronutrients like amino acids, carbohydrates, vitamins, minerals and fibers, which are beneficial for cure heart and boost immune system in humans, whereas anti-nutritional factors like phytic acids and polyphenolic compounds prevent from unlimited cell growth. One of the best parts of these small grains is that, these are 'Gluten-free'. Due to this property this prevent from celiac disease. Pearl millets and Finger millets are the comparatively more nutritious than other grains **[46]**.

2.1-Macronutrients in Millets:-

Millets are the main source of carbohydrates. A serving of 100 Gms raw millets provides 378 kilo calories. In which there is only 72.8 Gms carbohydrates content. Rice (78.2gms), Barnyard millets (74.3gms) and little millets (75.7gms) have the highest carbohydrate contents. Sorghum and Proso millets are the second position on the list. In pearl millet and finger millet starch are comprises of two types of polymers, and that are amylase and amylopectin. Which percentage are 15-30% and 70-85% respectively. In some semi arid region millets are the main source of energy. In pearl millet 67.5 Gms and in finger millet 72.0 Gms carbohydrates present **[47, 48]**. Protein is very essential nutrient for human's wellness. It is a basic requirement of mental and physical strength. Cereals have lack in protein and incomplete amino acids like lysine, tryptophan and methionine. This impairment is the main cause of malnourishment in developing countries. On the other hand pearl millet and finger millet are the richest source of albumins, globulins, glutelin and prolamin. Finger millet is high in amino acids. Finger millets have 24.6-36.2% prolamina and pearl millets have 22.8-31.7% prolamin. The biological value and net protein utilization (NPU) in pearl millet and finger millet is 58.8-65.6% and 55.7-62.9%. Which are higher than the other small millets **[49, 50]**. Proso millets (12.5gms/100gms) and Foxtail millets (12.3gms/100gms) have the greatest content of proteins than other millets. Kodo millets (8.3gms) and Little millets (8.7gms/100gms) have the least protein contain. Proso millets have the essential amino acids like thiamine, leucine and isoleucine which are very high than wheat and rice. In this order the fat content in millet consist 60% of unsaturated fatty acids along with lenolenic acid. Banrnyard millets (5.8gms/100gms), little millets (5.3gms/100gms) and Pearl millets have highest percentage of fat (5.0gms) than wheat and rice. Least fat content millets are Kodo millets (1.1gms/100gms) and Little millets (1.4gms/100gms) **[51]**. These millets have Triglycerol, free fatty acids and sterols. Fiber is the essential macronutrient which protect from heart disease like CVD and CHD. There are highest fiber content found in Barnyard millets (14.7gms/100gms), Kodo milltes (9.0 gms/100gms) and little millets (8.6gms/100gms), approximately 20.8% dietary fibers in pearl millet and 18.6% dietary fibers in finger millets are found. These are the higher percentage than wheat and rice. Fibers are associated with lower cholesterol, reduction of blood glucose level, prevent from constipation and intestinal

cancer. **Table 3** give you the macronutrient and micronutrient content reported by Millets Policy in India: Action plan (2012) **[52, 53]**.

2.2-Micronutrients: -

Vitamins and Minerals are known as Micronutrients, which are very essential for human body in very small amount. These are the components to get rid of micronutrient deficiencies in children and adolescent girls. Micronutrients plays a vital role in clotting of blood, bones building, normal heart beat, synthesize and metabolism of protein and fat, transportation of oxygen and also works as a co-enzymes in human body. It improves the immunity and keeps our nervous system healthy **[54-56]**. Approximately 1.7-4.3g/100gms mineral contents reported in millets. The mineral content of millets is much higher than other staple foods like Wheat and Rice. The prevalence rate of Iron and Calcium is on higher side in India. There are more than 35% women and 58% children under five years of age are bearing with Anemia. In this order pearl millet, finger millet, Barnyard millet and Maize are the gold mine of minerals. Finger millets have high amount of calcium content approximately 294-390 mg/100 gms. Foxtail millet and Maize are the greatest source of phosphorus. They have 290 mg/100gms and 348mg/100gms phosphorous component respectively. This is also abundant source of phosphorus, zinc and potassium. Finger millet is the good source of magnesium which helps to relax blood vessels and control blood pressure. Magnesium also promotes insulin sensitivity and helps to lower triglyceride level in blood. Barnyard millets (18.6mg/100gms) and Pearl millet (11.0mg/100gms) are the richest source of iron. Little millets has around 9.3 mg/100gms iron content found which prevent from anemia and increase the formation of RBC's. Mineral matters are also reported high in Barnyard millets (4.7mg/100gms) **[57]**. Vitamins are very basic nutritional requirement for children and pregnant women for their wellness. Millets are the rich source of β-carotene and vitamin B-complex (except vita. B12). Around 10.88mg niacin present in millets. It is deficient to other vitamins **[58]**. Millets are great source of Thiamine, Riboflavin and niacin. Foxtail millets have the highest thiamine content (0.60mg/100gm) than Wheat. Barnyard millets have the highest riboflavin content 94.20mg/100gms). The abstract of different types of millets can prevent mineral deficiencies and boost up health.

2.3-Phenolic Compounds:-

Phenolic compounds are the very large group consists of many functional components.

Basically these are classified in three sub groups and that are Flavonoids, Phenolic acids and Tannins. Flavonoids found in Finger millets in higher amount (1896µg/g). Little millets (173µg/g) and Foxtail millets (171µg/g) have high amount of hydroxycinnamic acid, which is the soluble form of phenolic compounds. Nutraceuticals or Pharmaceuticals are the bioactive compounds, which protect us from many degenerative diseases **[59]**. Pearl millets and finger millets are the bonanza of nutraceuticals like phenolic compound, flavonoids, phytic acids, carotenoids and tannins. Polyphenolic compounds reduce the risk of breast cancer and CVD. It is the well known antioxidants. In pearl millet there are 9.14% and in finger millet there are 3.83% phenolic compounds are found. Carotenoid is a precursor of provitamin-A. In finger millet, its average value of 199µg per 100 Gms. This is higher than other grains **[60]**. Foxtail millet and Proso millets have the greatest amount of carotenoid and tocopherol. Millets are the low glycemic foods which are the best choice for diabetic persons. Millets contents also act as prebiotics and probiotics which helps to maintain metabolism process and keep human healthy and fit **[61]**.

3. Health Features of Millets:-

There are so many researches that show that millets are the abundant source of Macronutrient, micronutrients and phenolic compounds. Which prevent and protect from many degenerative diseases. Millets content carbohydrates and high quality protein which is the safeguard of protein energy malnutrition (PEM) **[60-62]**. They have iron, calcium, iodine and zinc in higher amount which prevent from micronutrient deficiencies. Millets have phenolics compound like alpha-glycosidase which reduce the risk of hyperglycemia. It is also low GI which control blood glucose level and very beneficial for diabetics **[63-65]**. Millets are gluten-free small grains so it's practically cure gluten-sensitive diseases such as celiac disease. Millets are rich in phytate, phenolic acids and tannins, which play like 'anti-nutrients' and these lower the possibility of cancer. The varieties of seven millets (Pearl, foxtail, proso, finger, kodo, sorghum and little millets) have the phenolic extract which lower the LDL, Triglyceroid and cholesterol level and keep our heart safe and healthy. Millets are the gold mine of magnesium which sheltered our heart from stroke **[66-68]**. Millets are abundant source of antioxidants which works as Anti-Inflammatory agent. Antioxidants also work on stress management and wound healing.

Millets are the rich lode of antioxidants like methanolic extract which promote the collagen formation reduced the free radicals and maintains our ageing process and metabolic sickness. Finger millets are the rich source of Methanolic extract **[69-72]**. The dietary fiber content of millets control the release of carbohydrates and delay the absorption of fat and carbohydrate in the intestine. This property of millets defends from obesity and over-nutrition **[73-75]**.

4. Millet-based Traditional Foods:-

Millets are the ancient food particularly used in Diet of Asian and African people. Millets used in many form like roasted millets in the form of popcorn, germinated millets and baked millets like cake and cookies. Millet chapattis are the main staple food for Indians after Wheat and Rice. And porridge made from millets is the traditional food for Chinese, German and Russian peoples. Breads and muffins by multigrain flour using millets are very popular in developing countries. In the south part of India commonly local foods prepared with millets are *idli.dosa, puttu* and *adai*. Another traditional food made by millets is *senvaiyan*, which is use to prepare as a *kheer* in India. There are so many alcoholic and non-alcoholic products made from millets. Some alcoholic beverages are *Sur, Madua, Oshikundu* and *Koozh* prepared with fermented millets. Millets flour uses to prepare *papad, baddis* and many types of different sweets like *halwa, burfi and gulab jamun.* Millets are uses by every Indian and African families in a very traditional way **[76, 77]**.

4.1-Millets-based Modern Foods:-

Millets have several properties in which draught resistant and highly nutritional value are two of them. In the present scenario many health related problems are increasing along with this awareness of people is also grow with this. Peoples are started thinking about their health and have been beware about many degenerative diseases **[85-87]**. Now a day's modern people are moving towards uses of traditional foods in their daily life. Some modern foods like Pasta, macaroni, flax and corn starch are prepared with millets are using in developing countries as ready to eat breakfast cereals **[88-90]**. Keep all these things in mind many researchers prepared some contemporary food products by using millets. K.Uma Maheshwari **[80]** formulated a research on Anganwadi children and intervened them by millet based contemporary food and found high nutritional index after intervention. Shadang and Jaganathan **[10]** conducted a research on millet based bakery products using different

types of millets in it. They prepared cookies and sensory evaluation done by using all three levels. And found the cookies well acceptable. L.P.S.Rajput conducted a research and showed that millets are very nutritive food grains in cheapest form. They also prepared some muffins using millet flour and found it acceptable after sensory evaluation. R.V. Jaybhaye settled in their study that, what technology uses to processing of millets and preparation of millets based food products. This study explains the importance and utilization of millet based foods. According to this study many Agro scientist and nutritionist tried to find out the technical possibilities of production and processing of millets. And also proved that millets are the superior healing and curing food in Heart disease, cancer, weaning diet and off course to prevent malnutrition **[91-93]**.

5. Storage of Millets

Storage is a main objective to preserve grains for the future uses. The meaning of storage is to retaining food grains to the particular time period till the next harvest process. In developing countries there are so many possibilities to loss viability and nutrients during storage. And the main cause of loss nutrients and viability of millets are robbing of rodents, birds, pests and mould damage **[100, 101]**. Grains are stored by consumers for future uses. Millets are stored in a very traditional way in small containers. In market it is stored on large scales for commercial uses. During the storage of millet grains some important points should be considered and that is zero moisture, temperature control, control of microbial activities and prevention from insects. In African countries millets are stored in clay pots and gunny bags. Sorghum millets and pearl millets have the highest consumption in India, where these millets are stored in underground pits covered with straw **[102]**. On the smallest scale millets are stored in clay pots, bins and containers. Millets are also preserves in containers made by wood, bricks and stones and bamboo baskets in traditionally. These containers are mostly uncovered and kept inside the house. Sunlight is the most common way to protect millet grains from pests and microbial growth. If the millet grain can get prevent from mice, birds and other insects so it can be preserve more than two years. Keep the millet grains dry in a closed containers on a cool place is the very simple and best technique to preserve it for very long time **[10, 103]**.

Table 5: Comparative table of approximate Nutrient content of various cereals

Cereals per 100 gms	Protein (gms)	Carbohydr -ate (gms)	Fat (gms)	Crude Fibers (gms)	Mineral matter (gms)	Calcium (mg)	Phosphorus (mg)	Iron (mg)
Sorghum	10.4	72.6	1.9	1.6	1.6	25	222	5.4
Pearl millet	11.6	67.5	5.0	1.2	2.3	42	296	11.0
Finger millet	7.3	72.0	1.3	3.6	2.7	344	283	3.9
Proso millet	12.5	70.4	1.1	2.2	1.9	14	206	2.9
Foxtail millet	12.3	60.9	4.3	8.0	3.3	31	290	2.8
Kodo millet	8.3	65.9	1.4	9.0	2.6	27	188	1.7
Little millet	8.7	75.7	5.3	8.6	1.7	17	220	9.3
Barnyard millet	11.6	74.3	5.8	14.7	4.7	14	121	18.6
Maize	11.5	66.2	3.6	2.7	1.5	20	348	2.7
Wheat	11.8	71.2	1.5	1.2	1.5	41	306	3.5
Rice	6.8	78.2	0.5	0.2	0.6	10	160	1.8

Source: - Supporting Millets in India: Policy Review and Suggestions for Action (2012). [54]

6. CONCLUSION

Millets are the crop which grows in semi-arid region. It produced mostly in Asia and Africa. Countries like India, Nepal, Nigeria and Niger are the big producers of different types of millets. Millets are the rich source of macronutrients and micronutrients. These are full of all the essential amino acids and abundant source of minerals like calcium, zinc, magnesium, potassium and iron. Because of this quality it protects us from many diseases like diabetes, CVD, CHD, cancer and under nutrition. Due to its 'Gluten-free' quality it prevent from celiac disease and gluten allergy. These are also good source of nutraceuticals which cures from degenerative diseases like cancer. Millets can grow in low fertile soil with subtracting rainfall. This is the main reason that farmers are attracting to grow more crops of millets. Millets needs low investment for production and it is also pocket friendly grain. Due to its growing conditions and nutritious value millets production has been increased in all over the world. Millet based food products are very popular and highly acceptable by people. Millets can preserve for a long time with using many traditional and household grain storage practices. Millets have many health aspects and due to this present scenario where people's immunity level is decreasing day by day , which can be checked with this crop on low cost.

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