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A COMPARATIVE REVIEW ON BENEFICIAL ASPECTS OF VEG PROTEIN SOURCE OVER NON VEG PROTEIN SOURCE

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ABSTRACT:

Increased awareness of health, environmentalism, and ethical awareness have initiated a huge shift in attitudes towards vegetarianism, and therefore the comparison between veg and non-veg proteins has become more vital. The comparative review which compares the advantages of plant based protein sources over animal based protein sources on the basis of nutritional value, health benefits, environmental acceptability factors and the ethical considerations. Some of the plant based proteins obtained from legumes, nuts, seeds, and cereals are high in fiber, antioxidants, vitamins, and minerals also they are low in saturated fats and cholesterol and hence of significant value to long-term health. Conversely, animal based proteins obtained from meat, fish and eggs are complete proteins with all the essential amino acids however they tend to be linked with the increased risks of cardiovascular diseases, obesity, and other chronic diseases when consumed in excess. Additionally, plant-based diets have been shown to have a lower environmental impact because of its results in reduced greenhouse gas emissions, land use, and water usage. In addition, plant proteins are mostly acceptable option as they do not entail animal exploitation or contribute in the environmental impacts of massive animal agriculture. With the nutritional, health, environmental, and moral benefits, this review highlights the prospect of plant proteins for promoting healthy and sustainable food consumption without undergoing the undesirable effects of taking non-veg proteins.

Keywords: Veg protein source, non veg protein source, comparative factor between veg and non veg protein source, protein quantity, disease linked with non veg based protein source

Introduction:

WHAT IS PROTEIN ?

The article " Protein: The nutrition source" published by the Harvard T.H. Chen school of public health described that "Proteins are the macronutrients which are found in skin, hair, nails and everywhere in your body including cells and tissues. Proteins help our body in the process of repair, growth and giving energy to work everyday. From carrying oxygen to producing various enzymes for multiple functions; proteins play crucial roles in smooth execution of everyday's chores." et.al The president and fellows of Harvard school of public health

In today's market where diverse sources, types, brands of protein made with different formulation, processes and production methods are available; Selecting a good and healthy source of protein is so difficult for most of the consumers because of the trending news and limelight topics regarding the food safety of protein products. Most of the non vegetarian consumers of protein products only looks at the protein content while purchasing thinking this is good for the body but they don't think that not only the protein content but there could be various factors which should be considered too before purchasing the product to have better growth and to have proper bodily functions. In these article we will talk about the protein sources, nutritional value, recommend amount of protein, identification of fake protein and the factors which should be considered before purchasing particular type of protein source.

PROTEINS AND AMINO ACIDS

1 protein molecule is made up of group of amino acids who are considered as the "the building blocks of protein". Currently around 20 amino acids which differs in nature are in existence and they combine together with their suitable mate to form a new protein molecule. Our body use this protein production method everyday to use it for good bone, muscle health and to make compounds such as enzymes and hormones.

However out of these 20 amino acids; some of amino acids can be made by our body while some can't. Total 11 amino acids can easily be made by our body which are known as non essential amino acids and those remaining 9 amino acids which our body cannot make by its own are considered as essential amino acids.

1.3 NUTRITIONAL VALUES OF PROTEIN

You need to take enough protein via a good food diet to make your body work properly and complete everyday's chores. Our body doesn't store amino acids and it cannot make 9 essential amino acids so they could only be obtained by various food sources categorized as plant based food source and animal based food source.

Different food contains different type and amount of amino acid which are as follows :

- Animal based food source for taking proteins are poultry (chicken, turkey, duck, emu, goose), beef, lamb, kangaroo, seafood, etc which contains almost every essential amino acids.
- Plant based food source such as beans, lentils, nuts and whole grains also have all of these essential amino acids however the amount could be lower in compare to animal based food source
- Other plant based food sources such as soy, quinoa, dairy products, seeds and green vegetables contains large amount of all essential amino acids.

Almost 60% of the Indian population who is following "the vegan" or "the vegetarian diet" doesn't get all essential amino acids in compare to the population following "the non vegetarian diet" as meat, chicken and other non vegetarian products almost contains all essential amino acids.

To all the vegan diet population who wants to met with their protein needs should try pairing different ingredients to make a complete protein meal such as pairing cereals with legumes and baked beans on toast will give all essential amino acids found in a typical meat dish.

An old example coming from our ancestors time is that rice and dal contains different protein type and content however pairing dal with rice will give you all the essential amino acids and it is also considered as a complete protein meal.

WHAT IS THE RECOMMENDED DIETARY ALLOWANCE OF PROTEIN ?

In the field of nutrition, protein consumption can be examined from a quantitative or qualitative viewpoint. According to national institute of medicine the recommended dietary allowance of protein is 0.87g per body weight of consumer.

It means If your body weight is 50 kg then you should take 43.5 grams protein in a day

However this dietary allowance of protein varies according to the age, gender and condition of the consumer if he/she is following particular kind of diet or have any medical condition or taking medication from longer duration. Your daily protein needs can be met by following a proper diet prescribed by the industry specialist by considering your all conditions.

1.5 WHY PROTEIN IS IMPORTANT IN OUR BODY ?

If you are consuming the right food then it will help your body to grow healthy in many ways also it will help in muscle and bone building keeping them strong and maintained. Proteins also helps in the management of your body weight by controlling unhealthy cravings and keeping your stomach full.

According to various sources; it is seen that most of the people, especially young childrens don't consume enough amount of protein because of various reasons which can cause health problems such as poor growth, muscle loss, a weak immune system, etc. And in some of the severe cases it could lead to death.

In the U.S. and other wealthy countries, protein deficiency is rare because of the availability of plenty of protein-rich food products. In fact, many Americans people in the U.S. eat more protein than they need, especially mostly from animal sources.

Taking protein sources mostly from the animal origin source could lead to various health conditions which are as follows :

- **Heart disease**

Consuming even a small amount of red meat, particularly processed meat, many times in a week can increase the risk of heart disease, stroke, and premature death but consuming healthy protein sources such as beans, soy and nuts instead of red and processed meat can reduce the chances of these health threats.

- **Diabetics**

Including red meat twice or thrice in a month in your meals can lead to the risk of getting type 2 diabetes. Conversely, consuming nuts and beans can lower one's risk. Following a low-carb diet that is rich in healthy fats and vegetable proteins can lower the risk of getting type 2 diabetes.

- **Cancer**

Consuming more red meat and processed meats such as sausage/bacon can increase the chances of having cancer but if you eat plenty of colourful fruits and vegetables such as broccoli, kale, carrots and spinach then it will keep you stay healthy. Berries and other foods with antioxidants are beneficial in guarding your body.

- **Premature death**

Including large portions of red meat and processed meats such as sausage, bacon, hot dogs, and salami, can cause a small increase in dying early. On the other hand, consuming more plant-based proteins will make you live longer.

- **Weight control**

Protein foods can prevent disease and aid weight control however it is possible only if you select the correct protein source and follow a good healthy protein rich diet.

WHAT ARE THE FACTORS WHICH SHOULD BE CONSIDERED WHILE BUYING PARTICULAR SOURCE OF PROTEIN ?

- **Protein quality and essential amino acids**

Protein quality is a function of how well it facilitates the body for protein building. Because it is not always possible to measure directly how various diet proteins facilitate protein building, protein quality is estimated by how efficiently a protein delivers essential amino acids (EAAs) in adequate amounts required by the body.

Vegetarian Source usually have decreased bioavailability because of fiber and antinutrients (phytates, oxalates) but there are exceptions such as dairy and soy. For amino acid composition some are incomplete (e.g., legumes do not contain methionine, grains do not contain lysine), but their combination for example a meal containing dal with rice gives complete protein.

Non-Vegetarian Sources have better bioavailability, complete amino acid composition and are naturally superior proteins (e.g., eggs, fish, chicken). However they are linked with various diseases.

- **Digestible and absorption**

According to the article "Factors contributing to the selection of dietary protein food sources" published in February 2018; it states that "Including sufficient protein in meal that contains all essential amino acids is important for a healthy and balanced diet. To make sure various sources of protein fulfill these requirements, it is useful to score them according to how well they will provide the essential amino acids. The Food and Agriculture Organization (FAO) recently suggested that the use of a particular scoring system known as the Digestible Indispensable Amino Acid Score (DIAAS). This system helps in quantifying the quality of dietary protein by evaluating how effectively they supply important amino acids that the body can use and absorb."

Veg source proteins have fiber (e.g., beans, lentils), which may delay digestion but fermented foods (paneer, curd) enhances the digestibility.
Non-Vegetarian based proteins are easily digestible however they could be heavy on digestion based on preparation (e.g., fried meat).

- **Protein Quality of Common Foods and Its Impact on Daily Protein Needs**

Generally, animal proteins are high in quality as compared to the plant based protein; soy protein is the only exception, which is nearly of the same high quality as animal proteins. The majority of plant proteins have a DIAAS value of 50% to 70% which means they are less utilized by the body. If a protein's DIAAS is less than 100%, it is not entirely satisfactory to the body's essential amino acid requirement because of lesser digestibility and an incomplete profile of amino acids.

- **Protein density and energy density**

"The Dietary Guidelines for Americans (DGA) advises us to consume multiple sources of proteins but to replace the animal proteins with plant proteins. These guidelines do not, however, take into account the quality of the various sources of proteins. What this implies is that they place more emphasis on protein quantity rather than the utilization potential of the body. This deficiency in the consideration of protein quality is also present in the "ounce-equivalent" food advice in the Choose MyPlate guide." et.al Jamie I. Baum V

Vegetarian based protein source are high in fiber, antioxidants, and phytonutrients but potentially low in vitamin B12, heme iron, and omega-3s.
Non-Vegetarian proteins are high in B12, heme iron, omega-3s (fish), but potentially high in saturated fats.

- **Other nutritional factors**

The quality of protein present in a food is not equivalent to the overall nutritional value of that food. For instance, a food may contain a small quantity of protein i.e. low protein density; but the protein may be of high or low quality. Protein quality is unrelated to the quantity of protein present in a food. In order to appreciate the real worth of a protein-rich food in an optimal diet, both protein quantity and protein quality must be looked at.

- **Health Outcomes**

According to the article "Animal- and Plant-Based Protein Sources: A Scoping Review of Human Health Outcomes and Environmental Impact" it is concluded that "varied vegetarian diet can get the same quality of protein and similar amounts of nitrogen as yielded by animal protein or a mixed diet."

Moreover, the US scientific report of the 2015 Dietary Guidelines Advisory Committee (DGAC) also stated that a "Healthy Vegetarian Pattern" is associated with various health benefits.

- **Fat Content & Heart Health**

Vegetarian based protein sources are predominantly unsaturated fats; contain saturated fat (e.g., dairy).
Non-Vegetarian based protein sources contains fat whose content varies in which lean meat (chicken, fish) is heart-friendly but linked to various other diseases, whereas red meat and processed meat (bacon, sausages) are rich in saturated fats and cholesterol.

- **Anti-Inflammatory and Inflammatory Effects**

Vegetarian: A majority of plant proteins (lentils, tofu, nuts) shows anti-inflammatory effects.
Non-Vegetarian: Fish (rich in omega-3) is anti-inflammatory, whereas processed meats may induce inflammation.

- **Ethical and Environmental Impact**

Vegetarian proteins are generally more environmentally friendly and sustainable.
Non-Vegetarian proteins produce more carbon footprint in meat production, but very few sustainable options (free-range chicken, wild-caught fish) are preferable.

- **Cost and Availability**

Vegetarian proteins are not expensive and readily available (for example paneer, lentils, pulses, soy).
Non-Vegetarian proteins are partly expensive options and if you go for organic meats and healthy non veg protein source then it will be expensive as compared to veg based protein source.

- **Contamination**

The chances of your food getting contaminated is mostly seen in non veg origin protein sources in compare to veg origin protein sources. It is always recommend by the professional to wash and prepare non veg protein food by following proper steps as the contamination chances are highest.

- **Food safety of the product**

Nowadays you all must have seen various limelight videos of protein products trending on social media sites and news showing

1. Usage of live insects being crushed and used to produce protein powder and not mentioning it on the product labelling
2. Farming of pond fishes by feeding them waste products of other animals (such as chicken , cow , dog , etc)
3. Using crow meat and dog meat instead of chicken in dishes found by many test reports
4. Usage of fake paneer, vegetables, rice and eggs without mentioning in advertisement and online information
5. Inserting growth injections in the chickens to make them grow faster in compare to their original growth rate. In a report named " protein: The nutrition source" published by the president and fellows of Harvard college openly stated that "You may have also heard that the various companies use antibiotics in the production of animal-based foods that has contributed to the emergence of "superbugs," or strains of bacteria resistant to currently available antibiotics. In 2016, the FDA had announced a program which aims to limit the routine use of antibiotics in the non veg food production such as giving antibiotics to healthy animals to help them grow faster. As a consumer, you may want to find products "raised without antibiotics" if you plan on eating meat. Some companies feature this language on the packaging, others don't."

These all topics leading various health conditions challenges the food safety of the product and purity of protein content so select the protein source wisely and carefully as these could affect the protein content and its effect on the body.

Methodology

We selected newly published review articles and papers from verified sources and studied them to know the quantity of protein present in per 100 grams of samples; to evaluate do veg protein sources really contains more protein quantity if compared to non veg protein sources?

The following table represents the quantity of protein present in 100 grams of the sample

Sr. no	**NONVEG PROTEIN SOURCE**	Protein per 100 grams	**VEG PROTEIN SOURCE**	Protein per 100 grams
1	Salmon	39.3g	Spirulina	64.4g
2	Chicken breast (skinless or	31g	Soyabeans (dry)	36g

	cooked)			
3	Chicken (whole, cooked)	27g		
4	Beef (lean meat)	26g	Dry roasted pumpkin seed	26 g
5	Egg whole	13g	Cottage cheese (Paneer) Black beans	18g 15.2g
6	Egg white	11g	Lima beans Chia seeds	11.9g 16 g
7	Tuna	20.3g	Almonds Chickpeas Pumpkin seeds	19g 19g 19g
8	Cooked Shrimps	24g	Moong dal (dry)	24g
9	Mutton (lean or cooked)	25g	Cheese (Cheddar full fat) Lentils (Masoor dal, dry)	26 g 25g
10	Crab	18g	Flax seeds	18g

From the table it is observed that there are few of the veg protein sources are available who provides the protein quantity as similar to non veg based protein sources. Other veg based protein sources such as greek yogurt, quinoa, peas, milk contains around 8.4 , 8.1 , 4.12 and 3.4 grams of protein per 100 grams of sample which are less as compared to non veg protein products and they don't even contain all essential amino acids.

However when some of the veg protein sources such as oat, milk, chia seed, pumpkin seed, almonds are combined with veg main course meal then they can provide as same protein content as nonveg food meal.

1.8 HOW TO IDENTIFY THAT THE PROTEIN YOU ARE HAVING IS NOT FAKE ?

Various laboratory methods are applied in different laboratories to determine the total protein content in raw products and finished meat substitutes. Among the methods employed are

- Dumas method (AOAC 992.15) –The sample is incinerated using a highly hot furnace. The nitrogen gas that is released is measured to determine the quantity of protein present in the sample.
- Kjeldahl procedure (AOAC 981.10 or 928.08)- Chemicals degrade the sample and release nitrogen. Quantifying the nitrogen indicates the amount of protein present in the sample.
- Lowry procedure-A chemical interacts with protein and changes colour. The colour change indicates the amount of protein present in the sample.
- Bradford : A specific dye binds to protein and changes colour. The colour indicates the amount of protein present. Each of these techniques serves to quantify how much protein there is in a sample.

Not only the laboratory methods , you can also test the protein samples at you home easily by using some quick testing methods which are as follows :

- Iodine Test: The iodine test, also known as the starch test, is a simple chemical test used to identify the presence of starch in a sample. In most of the cases of fake paneer they are made up of starch so you can test it by using this test.
- Biuret Test: The Biuret test is used to detect the presence of proteins

Conclusion

From this review it is concluded that the plant proteins such as (lentils, soy, paneer, tofu) contains fiber, vitamins and antioxidants but may lack some of the essential amino acids but soy-based sources such as soy chunks, tofu provides the protein comparable to meat and are great vegetarian alternatives. Even combining 2 or more veg protein sources in a meal will give all essential amino acids.

Animal proteins such as (chicken, fish, eggs) are complete proteins, containing all essential amino acids, but may have higher cholesterol and fats also associated with various disease and contamination factors.

Here we are not saying that you should only eat animal based protein or take veg based protein source; the point is to understand how much protein a food has (protein density) and how well your body can use it (protein quality) when planning a healthy diet. These things matter for getting enough good-quality protein. But remember, they're not the only things to think about when choosing protein-rich foods—other factors matter too.

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