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ROLE OF DIFFERENT GROWTH MEDIA FOR THE ASSESSMENT OF PROTEIN CONTENT IN SELECTED MICROSCALE LEGUMES

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ABSTRACT

In today's world, people are focusing more towards a healthy lifestyle. One of the most important elements for the human body is Protein. A majority part of earth's ecosystem comprises of protein. This study presents the estimation of protein conducted in four different legume species namely, Chick pea, Alfa alfa, Black gram, and Pea in different growth media such as, Chemical fertiliser, Goat manure and Cow-dung manure. Samples of all the species were randomly selected from all the sets of growth media for protein estimation through spectrophotometry and compared it with standard BSA. The experiment showed high protein content in organic fertilisers such as Goat manure and Cow-dung manure. The growth medium of Chemical fertiliser showed poor protein content in all the samples.

Keywords: Microscale legumes, protein estimation, protein contents, chick pea, alfa alfa, black gram, pea, growth media

INTRODUCTION

Many people suffer from a deficiency of essential micronutrients. Microscale legumes can transform the whole idea of vegetables to resolve the need for a diet with fresh, nutrient-rich, and high content of phytocompounds necessary for a healthy body. In the recent years, the consumption of microscale legumes has increased among the people due to their high nutritional value and thus there is a growing demand of it worldwide. The yield and quality of microscale legumes depend on several various factors such as soil condition, temperature, etc.

Microscale legumes can be grown in greenhouses, soil or soilless, organic or non-organic, solid or hydroponic. The present study was conducted on growing of four different microscale legumes samples in different growth media and to estimate its total protein content on it. Four different soil samples were prepared by using different growth promoters.

The study's main objective is to evaluate the growth of 4 different legumes; Chick pea, Alfa alfa, Black gram, and Pea. All the seeds were cultivated in soil with different growth media to estimate the protein contents of the selected microscale legumes. The growth of microscale legumes in each medium was evaluated, post which the protein contents of each species were assessed. In terms of overall growth, the medium with chemical fertiliser showed the most results as compared to other growth media. In terms of the protein contents of the select microscale legumes, the growth media with goat manure served the best. This study shows that microscale legumes are a better source of proteins. Finally, microscale legumes were better growing with goat manure which could also be sources for functional components for dietary supplements and sustainable agriculture.

MATERIAL AND METHODS

The present experiment was carried out in the Department of Botany, Gujarat University, Ahmedabad, during February and March 2023.

Growing microscale legumes and sample preparation:

Four types of microscale legumes were selected for the experiment namely, Chick pea (Cicer arietinum), Alfa alfa (Medicago sativa), Black gram (Vigna mungo), and Pea (Pisum sativum)

which were sown in plastic trays of 45 x 32 x 10 cm (lbh). The first set of all four microscale legumes was grown in plain growth media with no fertiliser and the Control series was prepared. The second set of sprouts was sown in Chemical fertiliser media. The third and fourth sets of sprouts were prepared with Goat manure media and Cow-dung manure media respectively. All the seeds were broadcasted at the rate of 250 gram per tray. Shallow sowing of the seeds was done and the trays were watered daily for maintaining the optimum moisture level in the substrates.

The experiment was conducted in completely randomized design (CRD) and the effect of interaction of different media to protein content of microscale legumes was studied. The trays were kept inside a cage in the department. During harvesting, the plants were randomly plucked off whole from the trays and the roots were cut off with a sterilized blade. Three samples of 1 gm each were prepared from each series of growth medium. The samples were first crushed with a mortar and pestle taking 1gm for each in 10 ml sodium phosphate buffer solution followed by its centrifugation. The supernatant was then utilised for the assessment of protein content.

Protein Estimation:
The total protein content was estimated with standard Bradford method by using BSA standard. Different concentrations of BSA were prepared as Standard series. To estimate the protein content of the select samples, Bradford's reagent was added to the supernatant that binds with the protein molecules making the protein assay simpler. The absorbance was measured at 595 nm. UV/Vis spectrophotometer was used for the purpose of protein estimation.

RESULTS AND DISCUSSION

Table 1: Protein estimation of BSA Standard.

Concentration of BSA (ml)	Absorbance at 595 nm
0	0.0486
0.2	0.0502
0.4	0.0523
0.6	0.0553
0.8	0.0566
1	0.0574

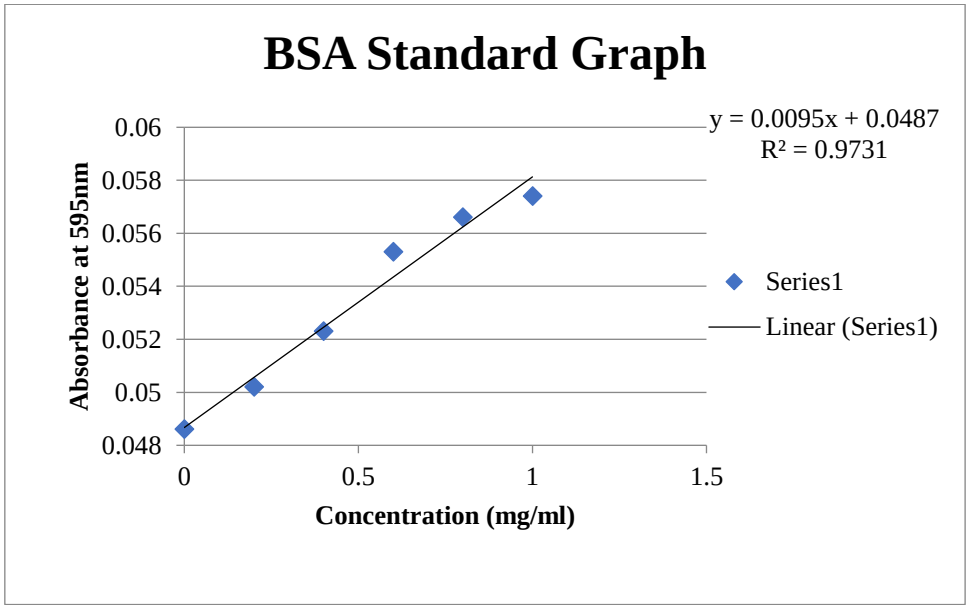


Table 2: Assessment of the protein content of all samples of the microscale legumes.

Species	Growth Media	Conc.	Sample 1		Sample 2		Sample 3		Avg. Abs	Avg. Protein (mg/ml)
			Abs.	Protein (mg/ml)	Abs.	Protein (mg/ml)	Abs.	Protein (mg/ml)		
Chick pea	Control	1 ml	0.163	11.77684	0.162	11.67395	0.157	11.1595	0.160667	11.53676
	Chemical fertiliser	1 ml	0.144	9.821915	0.143	9.719024	0.144	9.821915	0.143667	9.787618
	Goat manure	1 ml	0.203	15.89248	0.143	9.719024	0.139	9.30746	0.161667	**11.63965**
	Cow-dung manure	1ml	0.16	11.46817	0.153	10.74793	0.146	10.0277	0.153	10.74793
Alfa alfa	Control	1ml	0.156	11.05661	0.154	10.85082	0.153	10.74793	0.154333	10.88512
	Chemical fertiliser	1ml	0.153	10.74793	0.148	10.23348	0.151	10.54215	0.150667	10.50785
	Goat manure	1ml	0.158	11.26239	0.183	13.83466	0.182	13.73177	0.174333	**12.94294**
	Cow-dung manure	1ml	0.169	12.39419	0.175	13.01153	0.163	11.77684	0.169	12.39419
Black gram	Control	1ml	0.115	6.838079	0.113	6.632297	0.116	6.94097	0.114667	6.803782
	Chemical fertiliser	1ml	0.11	6.323624	0.124	7.764097	0.112	6.529406	0.115333	6.872376
	Goat manure	1ml	0.123	7.661206	0.19	14.5549	0.13	8.381442	0.147667	**10.19918**
	Cow-dung manure	1ml	0.118	7.146752	0.124	7.764097	0.121	7.455424	0.121	7.455424
Pea	Control	1ml	0.14	9.410351	0.15	10.43926	0.15	10.43926	0.146667	10.09629
	Chemical fertiliser	1ml	0.154	10.85082	0.144	9.821915	0.161	11.57106	0.153	10.74793
	Goat manure	1ml	0.153	10.74793	0.17	12.49708	0.169	12.39419	0.164	**11.87973**
	Cow-dung manure	1ml	0.17	12.49708	0.151	10.54215	0.155	10.95371	0.158667	11.33098

Table 3: Average protein estimation of Chick pea

Species	Growth Medium	Avg. protein (mg/ml)
Chick pea	Control	11.53676
	Chemical fertiliser	9.787618
	Goat manure	11.63965
	Cow-dung manure	10.74793

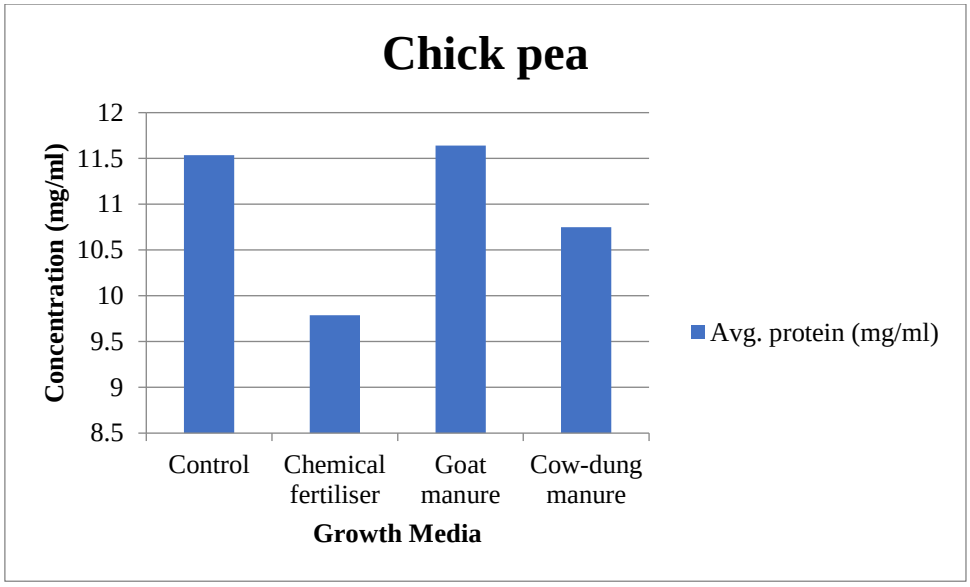


Table 4: Average protein estimation of Alfa alfa

Species	Growth Medium	Avg. protein (mg/ml)
Alfa Alfa	Control	10.88512
	Chemical fertiliser	10.50785
	Goat manure	12.94294
	Cow-dung manure	12.39419

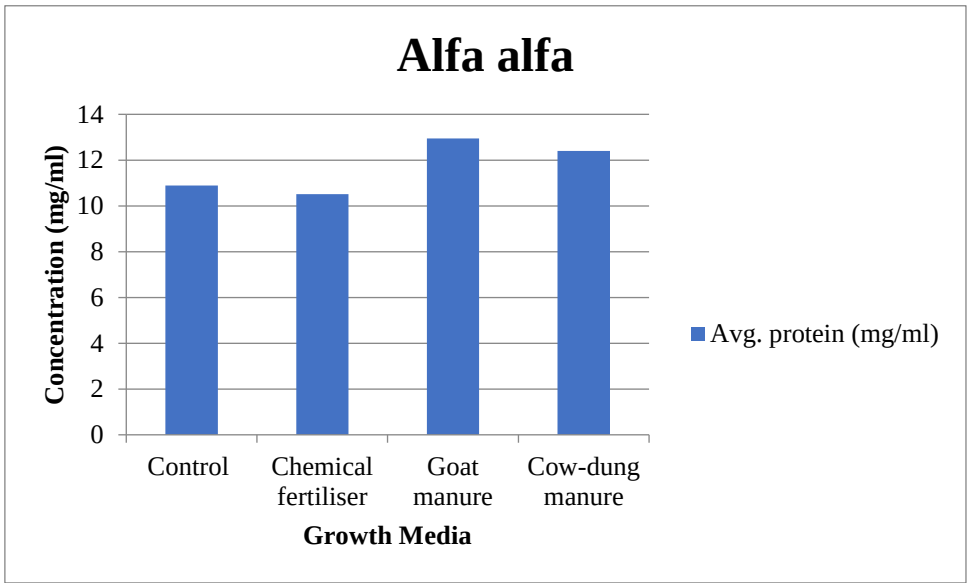


Table 5: Average protein estimation of Black gram

Species	Growth Medium	Avg. protein (mg/ml)
Black gram	Control	6.872376
	Chemical fertiliser	6.803782
	Goat manure	10.19918
	Cow-dung manure	7.455424

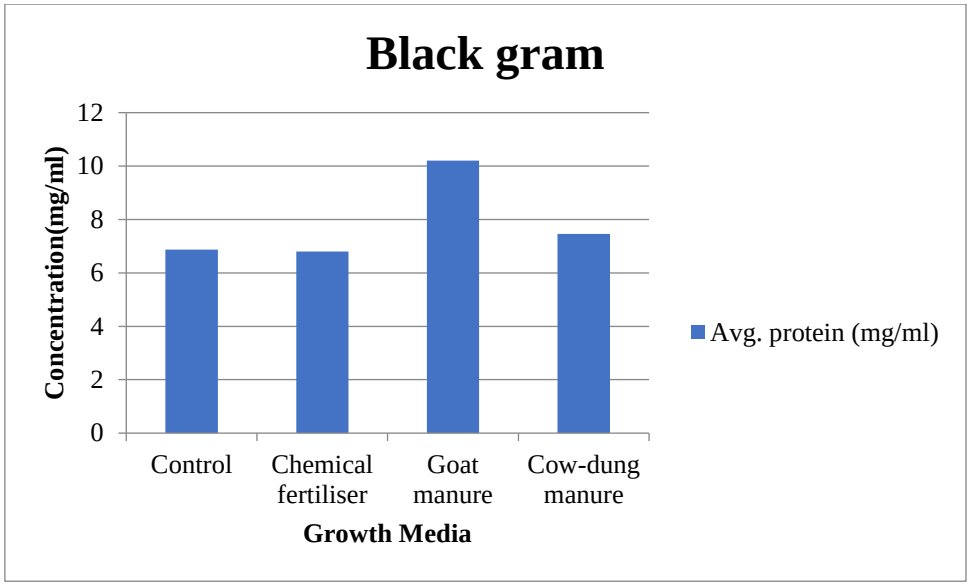
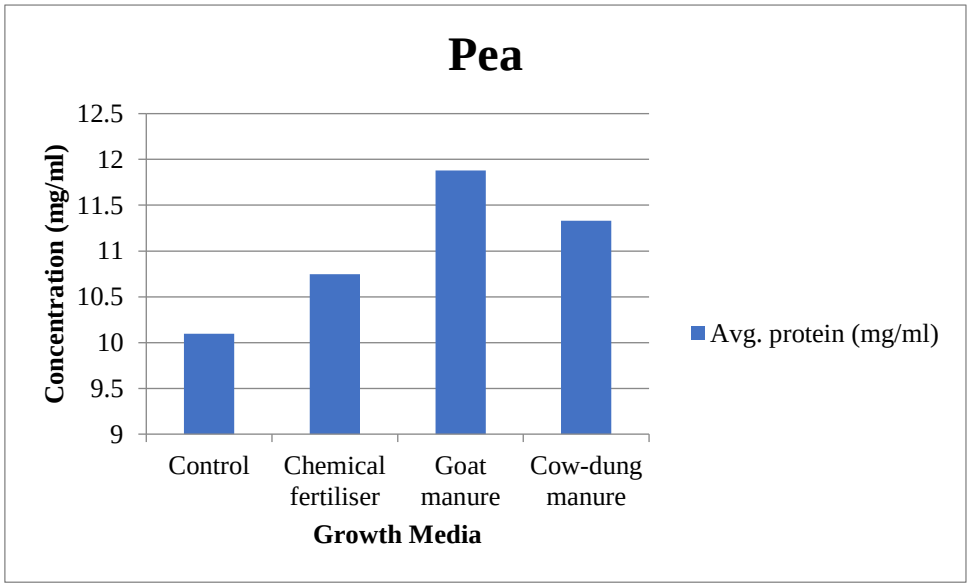


Table 6: Average protein estimation of Pea

Species	Growth Medium	Avg. protein (mg/ml)
Pea	Control	10.09629
	Chemical fertiliser	10.74793
	Goat manure	11.87973
	Cow-dung manure	11.33098



DISCUSSION:

The protein content analysis of all the samples showed significant results.

In Chick pea, the protein content in Goat manure growth medium (11.63 mg/ml) was the highest. The growth media of Control medium showed significant results (11.53 mg/ml) where the protein content was more than the Cow-dung manure (10.74 mg/ml). The samples of Chemical fertiliser growth medium resulted the lowest protein content (9.78 mg/ml).

The highest protein content in Alfa alfa was found in the Goat manure growth medium (12.94 mg/ml) and the lowest in Chemical fertiliser growth medium (10.50 mg/ml). The protein

content in the growth medium of Cow-dung manure (12.39 mg/ml) was significantly more than the Control growth medium (10.88 mg/ml).

Black gram showed the highest protein content in the Goat manure growth medium (10.19 mg/ml) and the lowest in Control growth medium (6.80 mg/ml). The protein content in the growth medium of Cow-dung manure (7.45 mg/ml) was significantly more than the Chemical fertiliser growth medium (6.87 mg/ml).

In Pea, the protein content in Goat manure growth medium (11.87 mg/ml) was the highest. The growth media of Cow-dung manure medium showed significant results (11.33 mg/ml) where the protein content was more than the Chemical fertiliser growth medium (10.74 mg/ml). The samples of Control growth medium resulted the lowest protein content (10.09 mg/ml).

Cumulatively, this study reports that out of all the four species, the highest protein content was recorded in Alfa alfa in the Goat manure growth medium and the lowest protein content was recorded in the species of Black gram in the Chemical fertiliser growth medium.

CONCLUSION

In this rapidly changing world, adulteration in food items is becoming havoc. To ensure better health and stop consumption of adulterated food, it is recommended to grow consume microscale legumes especially grown in organic growth media such as Goat manure and Cow-dung manure. Organic manure adds nutrients through the natural processes of nitrogen fixation, solubilising phosphorus, and stimulating plant growth through the synthesis of growth promoting substances.

This experiment concludes that though the growth of microscale legumes is the most in Chemical fertiliser, the protein content however, is the lowest in all the species grown in Chemical fertiliser growth medium. Chemical fertiliser tends to high soil compaction which results in decreased permeability of soil, drainage and aeration capacity, water availability, absorption of nutrients, plant growth and yield.

In future, the microscale legumes can be studied for estimation of other essential nutrients such as carbohydrates, lipids, vitamins, etc. as well as the potency of organic manure in comparison to chemical fertilisers can be assessed. Moreover, other environmental parameters for the growth of microscale legumes such as soil pH, temperature, light, soil porosity, drainage, etc. can be studied for an elaborate report.

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