

Research on Vegan Nutrient Medium for Biotechnology and Microbiology.

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Abstract: In an experiment conducted on tissue culture at our school, we noticed that the nutrient medium ie, Agar is very expensive. Also, it contains animal meat, beef, etc. So we wanted to come up with a cruelty free and cost effective nutrient medium which is suitable for plant tissue culture. We started testing different waste materials from plants that are readily available. For example, we checked nutrients present in banana peel, waste and remains of corn (butta), potato peels (raw potatoes) and compared it with Agar medium. From which we selected the best media ie, 50% corn starch and 50% potato starch media (CP media). This media was taken for further experiments on plant tissue culture. This 50-50% CP media was chosen for checking the growth of potato buds, carrot buds and bean seed embryo. Unfortunately, after a week they got contaminated and also the media was a little shaky. So under the guidance of Dr. Siddhivinayak Barve, we added a vegan gelatin to the media. The results showed were excellent. The growth in the tissue was seen. For the experiments, the care was taken about sterile environment. Further results of suitability of our media for tissue culture from V. G. Vaze College, Mulund East.

Introduction:

Animal cruelty in the name of Science is not acceptable. Agar nutrient medium contains some amount of meat and beef extract. This leads to cruelty against animals. We just wanted to check the effectiveness of the Vegan Nutrient media. For that we tested the Nutrients present in Agar and our Vegan medium.

The research project is about a small step towards avoiding animal cruelty and create something best out of waste which can be a paradigm shift in the world of biotechnology and microbiology.

Hypothesis:

Vegan Nutrient medium can be used as a growth medium for plant tissue culture.

Need for the statement:

To know the effectiveness of the Vegan Nutrient medium made out of plant waste materials like raw potato peels and

Work plan:

- Select the suitable vegan nutrient medium.
- Conduct analytical tests on nutrient levels of Agar medium and Vegan Nutrient medium.
- Conduct experiments on Tissue Culture using both the types of media.
- Compare the growth of tissues in both the types of media.

Methodology:

Test results of Vegan and Agar medium:

Sr. No.	Nutrients	Vegan Samples			Agar Samples
		Corn starch	Potato Starch	Corn – potato [50-50%]	
1.	Proteins (g/100g)	12.39	10.25	13.56	30.04
2.	Carbohydrates (g/100g)	74.34	77.85	77.90	54.20
3.	Energy (Kcal/100g)	362.81	354.648	362.82	338.17
4.	Nitrogen (%)	10.767	09.89	11.89	0.293
5.	Starch (%)	80.529	68.803	80.69	BLQ

From the analytical results, we chose Corn-Potato Vegan medium as our best suitable option. We compared it with Agar medium. For making the suitable Vegan medium, we took the powder in different amounts in 150ml of distilled water. We created different concentrations of medium to check the sturdiness of it.

The given concentration is boiled in water for 6 mins, poured in the container/jar and autoclave it.

Sr. No.	Corn-Potato 50-50% Samples	Distilled water (ml)	Remarks
1.	A (30gm)	150	Thick and too viscous, sturdy but cakey
2.	B (25gm)	150	Less Viscous, sturdy but still cakey
3.	C (20gm)	150	Appropriately Viscous, less sturdy (no more cakey) jelly like
4.	D (15gm)	150	Less Viscous
5.	E (10gm)	150	Liquid consistency

From the above results, Sample C was chosen as an appropriate concentration but still it should be sturdy enough. So, under the Guidance of Dr. Siddhivinayak Barve, we conducted another test. He suggested us to add a vegan gelatine in order to make it sturdy and avoid shaking of the medium. We added a waste material from plants called as Resin. We added resin in the nutrient medium, in different amounts and checked the sturdiness of the medium.

Sr. No.	Resin as vegan gelatin (gm)	Nutrient sample 20 gm in 150 ml of Distilled water	Remarks
1.	1	20gm+150ml	Not so sturdy
2.	2	20gm+150ml	Not sturdy
3.	3	20gm+150ml	Appropriately sturdy
4.	4	20gm+150ml	Thick concentration
5.	5	20gm+150ml	Too thick concentration

From the results, it was clear that in 150 ml of Distilled water, 20 gm of vegan nutrient powder and 3 gm of resin must be added. Care was taken about the hygiene.

- 2 spirit lamps were kept on both the sides of the Experimentation area to avoid germs from the air.
- The place was cleaned with dettol.
- The plant materials were thoroughly washed under the running tap water.
- They were then dipped into 5% Teepol for 10 mins.
- They were surface sterilised by immersing in 70 % ethanol for 60 sec, followed by 30 mins in sod. Hypochlorite.
- This process of sterilisation is repeated several times to keep the samples germ free.
- The medium was then taken for comparison between Vegan and Agar medium:

Sr. No.	Growth on	🌱 Carrot bud	🌱 Potato bud	🌱 Bean seed embryo	🌱 Carrot bud	🌱 Potato bud	🌱 Bean seed embryo			
		Plant tissue culture using Vegan Nutrient medium			Plant tissue culture using Agar Nutrient medium			No visible growth		
1	Day 1	No visible growth	No visible growth	No visible growth	No visible growth in all					
2	Day 5	A small bud observed	Bud arises of 0.9 cm	A tiny shoot seen	A tiny bud arises					
3	Day 10	Growth of 1.1cm	Growth of 1.9 cm	Contaminated	Growth of 1 to 1.5cm average					
4	Day 15	Contaminated	Contaminated	Contaminated	Contaminated					

Conclusions

1. We collected 2000 gm of raw materials from the stalls and shopkeepers, out of which we extracted 300 gm of powder.
2. Our Vegan Nutrient medium showed optimum results. The experimentation was successful as the buds showed a visible growth.
3. Agar medium can be replaced by our Vegan Nutrient medium as the experiments showed similar results.
4. Our media is absolutely cosy effective and in comparison with Agar medium which ranges from 4000 to 8000 rupees per 100 gm.
5. All the tests were Validated by Mr. Swapnil Kadam and Dr. Siddhivinayak Barve Sir from V.G. Vaze College, Mulund.
6. In the initial stages, our samples got contaminated in 2 days. But we rectified our mistake and took care of the sterilization. Some times, experiments can be a failure, but with trial and error method we have to keep learning.

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