

Resin Selection for Steviol Glycoside Extraction From Stevia Leaf

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Abstract – *Stevia rebaudiana* has gained an attention which has profound that sweeter flavor is present in the glycoside compound. It has been certainly adding a main chemical ingredient to the stevioside (Steviol Glycoside). With the extensive selection of the adsorbent resin and use of stevia leaf in hot water at 50-55°C with the ratio of 1:5 addressing the flocculation process. It has utilize the resins XAD (4,7,16, 1180) on different BV (Bed Volume) for desorption of concentration at 40%, 60% and 100%. It has been found with 1kg of pure steviol glycosides is obtained from 200 to 400 grams of dried stevia leaves. It can be utilized for clinical practices and health issues such as diabetes and corpulence.

Key Words: Hot water extraction, steviol glycoside, stevioside, Elution and BV (Bed Volume)

1. INTRODUCTION

The steviol glycoside is particular chemical structure through which significant difference in the taste quality responsibly sweet taste in it has grabbed attention for conducting research. It has diligently followed the 11 main steviol glycosides including the elements from A to F and dulcoside A with nearly 0.5% concentration. It has also trailed on the rebaudioside-C in between 1-2%. It can not matter what present that the artificial sugar utilized in the energy supplements have concern with the genuine products. However, the utilization of the stevia plant gathered from the south can create a extraction of the sugar and home grown team to treat the indigestion and grievances from the stevia leaf. In this study, the selected adsorbent AMBERLITE XAD4, 7, 16, 1180 will carry out the non-ionic process as it has macro reticular structure to phase out the high surface area.

1.1 PROCESS OF ISOLATION FOR STEVIOL GLYCOSIDE

Regeneration of the absorbent material represent the impurities and solvent composition to manage the impurities. In another aspect, the method have added on the first solvent as adsorption device and second solvent is facilitating the least portion of the remaining in the adsorption device. It has added on the water miscible organic solvent, Pure solvent, dilute bases (0.1-0.5% NaOH), concentrated bases (2-4% NaOH), Dilute acids and dilute oxidizing agents for enhancing the protein fouling.

1.2 Adsorption

Adsorption is the process through which the substance in one phase, is removed from the accumulation of the phase with separate phase where the formation of bonds can be added on the molecules in the fluid phase and surface molecules.

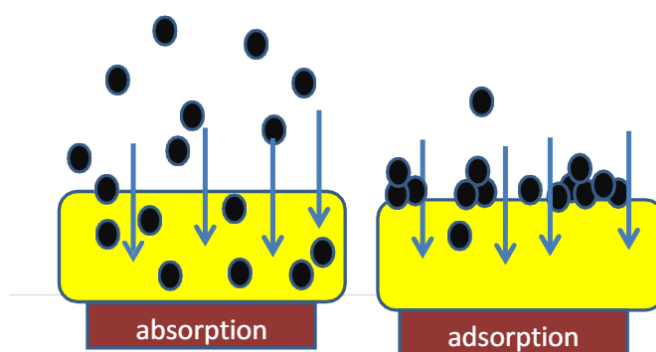


Figure 1: Adsorption

1.3 Desorption

Desorption is the reverse process through elute and separation of active compound can meet with the released substance when face on the surface. The system is being in the state of sorption in between bulk and adsorbing phase.

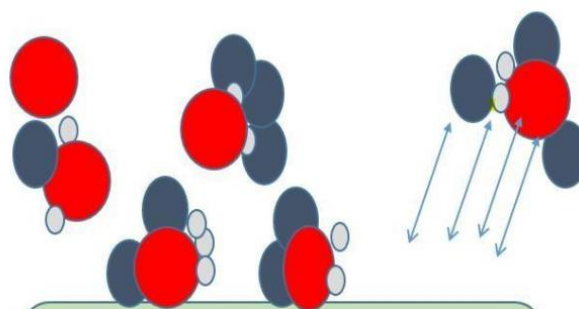


Figure 2: Desorption

2. ADSORBENT SELECTION (RESIN)

There is variant of adsorbent (Resin) which are functioning to raise or lower the process of the adsorbent properties.

Table -1: ADSORBENT SELECTION

Parameter	AMBERLIT E XAD4	AMBERLIT E XAD7	AMBERLIT E XAD16	AMBERLIT EXAD1180
Matrix	Macroporous cross linked aromatic polymer	Styrene-divinylbenzene	Macroporous cross linked aromatic polymer	Macroporous cross linked aromatic polymer
Physical Form	White Translucent beads	Small beads	White Beads	White Beads
Moisture Holding Capacity	54 to 60%	-	-	-
Shipping weight	680 g/L	-	-	-
Specific Gravity	1.01 to 1.03	-	-	-
Particle size	0.49-0.69 mm	20-60 mesh	-	-
Uniformity Coefficient	≤2.0	-	-	-
Fines	<0.350 mm:5.0% max	-	-	-
Coarse Beads	>1.18 mm	-	-	-
Surface Area	≥750 m ² /g	~300 m ² /g	-	-
Mean Pore Size	-	90 ^o A	-	-
pH Range	0-14	0-14	0-14	0-14
Maximum Temperature Limit	150°C	150°C	150°C	150°C
Minimum Bed Depth	75 cm	75 cm	75 cm	75 cm
Flow rate	2-16 BV/h		2-16 BV/h	2-16 BV/h
Application	Adsorption of hydrophobic molecules	Extraction of organochlorine compound	Recovery and purification of antibiotics	Recovery and purification of antibiotics

The bed volume at 1m³ solution per m³ resin is promoted through common characteristics of all resins with operational pH range (0-14). It has added on the flow rate ranges for loading, displacement and regeneration and rise with the structure and properties for different types of adsorption process.

3. SAMPLE TESTING UPLC

Ultra-Performance Liquid Chromatography (UPLC) has enhanced the resolution, speed and sensitivity over High Performance Liquid Chromatography (HPLC) using the particles smaller than 2µm. It has involve the distribution of analytes between mobile and stationary phases that results in the evolution of the elution times and detected and recorded chromatograms.

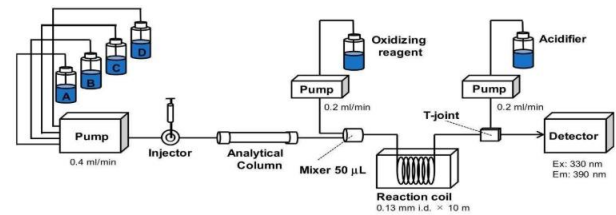


Fig -1: Working of UPLC

The key components have included solvent reservoir, injection valve, pump, detector and data processing unit.

UPLC columns have added on the diameter, length, particle size and material to notably utilize the UPLC of companies like Waters, Agilent Technologies, Phenomenex, Altech Associates.

It has certainly added on the advantages and disadvantages like higher selectivity and sensitivity with reduced solvent consumption and real-time process monitoring. It has higher back pressure can reduce column lifespan with the efficient sample analysis with operational challenges.

4. RESULTS AND DISCUSSION

An iteration in UPLC sourced with rose flower tube has added on spectrophotometer analysis at various concentration (5%, 8%, 10%, 15% and 20%).

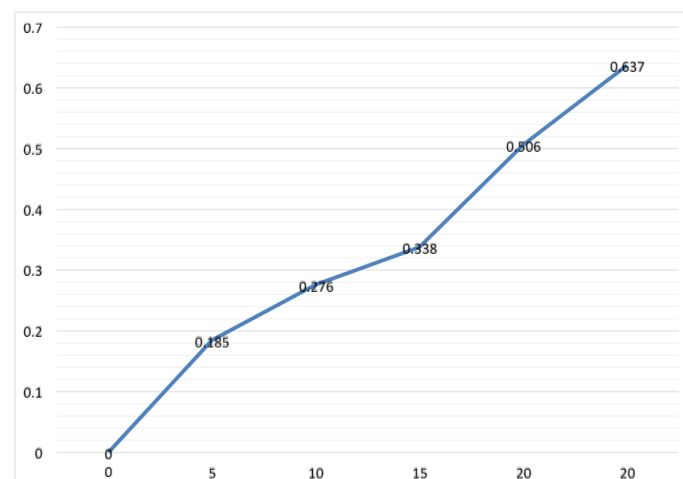


Chart -1: Concentration Vs Absorbance

It has showcase on the increase in the absorbance with concentration, peaking at 0.637 at 20%.

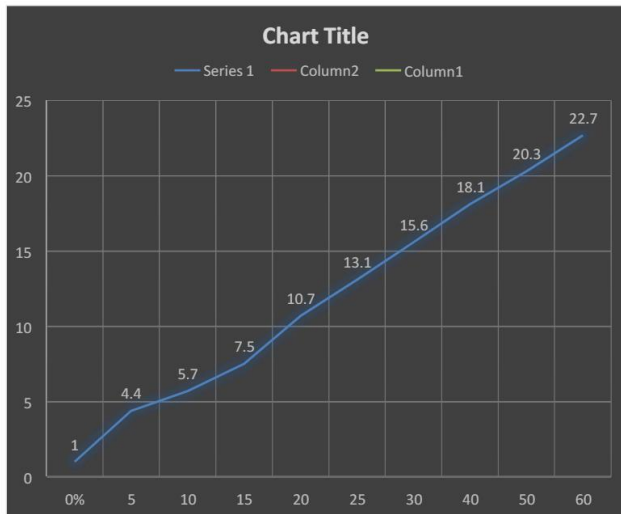


Chart -2: Concentration Vs Brix

It has similarly included with the varied concentration (1% to 40%) representing the corresponding increase in Brix percentage.

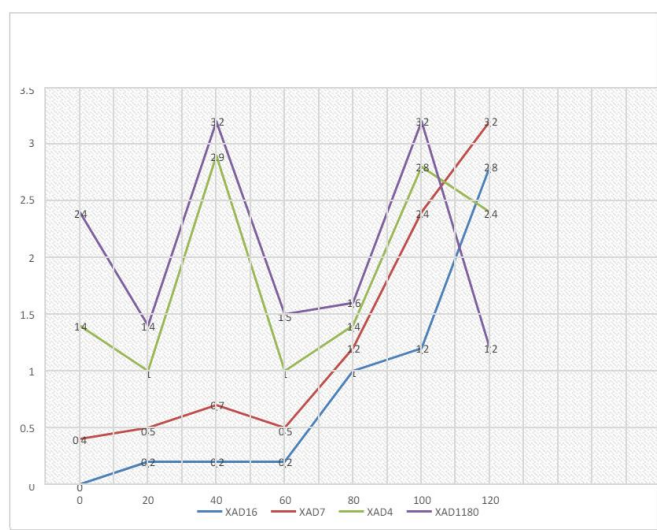


Chart -3: Time Vs Brix for Resin

It has isolated Steviol glycosides, SL concentration processing to used columns filled with XAD resin (4, 7, 16, 1180) at different bed volumes and ethanol concentration to be tested. It has also revealed that the XAD16 resin with 2B yield have the highest recovery.

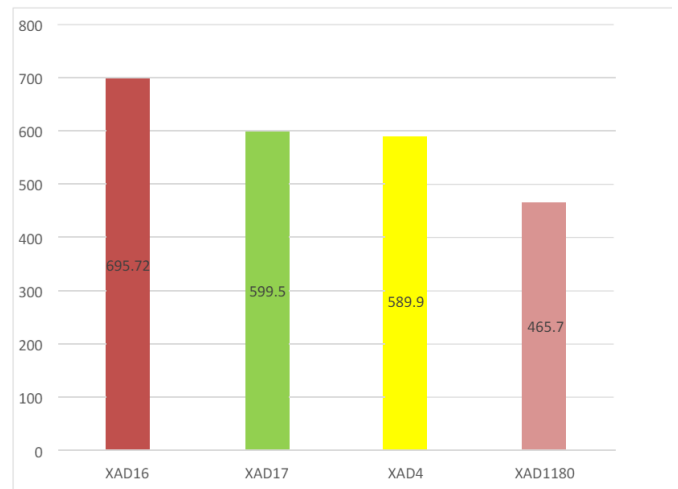


Chart -4: Yield of all Resins

The column temperature mitigating the highest yield across most resins with XAD165 showcasing 40% ethanol elution in adding yield with reduced TDS, salinity and conductivity affirming on the efficiency of the isolated steviol glycosides.

5. CONCLUSIONS

By modeling existing industrial processes, a sweetener containing over 50% of steviol glycosides has synthesized using PHWE. It has effectively surpass on the yield from dried stevia rebaudiana Bertoni leaves to process in the different locations. In future, it can be used for extraction of the Steviol glycoside to raise on the food and health measures benefiting diabetic patient and pregnant women in future.

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