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Research Article

Physico-Chemical Characterization of Amylose and Amylopectin Using Revan Topological Indices

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Polysaccharides are biomaterial with great biocompatibility, biodegradability, and low toxicity. There are long chains of monosaccharide units linked together by glycosidic bonds. They have a wide spectrum of functional properties and are essential to life's survival. These are a makeup of storage polysaccharides (such as starch and glycogen). Starch is found in plants; the condensation of amylose and amylopectin produces starch. The main contribution of this paper is to compute Revan topological indices of Amylose and Amylopectin that can study their physicochemical characterization. Furthermore, an analysis was being carried out among topological indices to find out compatibility. These indices will be applicable in various useful research aspects.

1. Introduction

Chemical graph theory integrates graph theory and chemistry in an area of mathematics. To obtain insight into the physical features of chemical substances, graph theory is employed to mathematically model them. Chemical reaction network theory is a branch of applied mathematics aimed at simulating the performance of different chemical systems. It has gained an increasing research community since its inception in the 1960s, owing to its applications in biochemistry and theoretical chemistry.

Atoms are represented by vertices in chemical networks, and bonding is represented by vertices in chemical graphs theory. The topological index is the numerical parameter that predicts the characteristics of that chemical graph. A topological index (TI) is a mapping which gives a numerical value to a chemical graph based on several physicochemical properties of the chemical. Organic molecules' biological activity, as well as their physicochemical and chemical properties, are linked to their molecular structure. Topological indices (TIs) and their derivatives, such as Quantitative Structure-Property Relationships (QSPRs), are widely used as molecular descriptors in the development of QSARs.

Quantitative Structure-Activity Relationships (QSARs), Quantitative Structure-Property Relationships (QSPRs), and Quantitative Structure-Toxicity Relationships (QSTRs) are all built using topological indices (TIs). The goal of establishing a topological index is to assign a numerical value to each chemical structure while keeping it as selective as possible. Structures can be classified and chemical and biological properties predicted using these indices [1, 2]. None of the known topological indices can uniquely characterize molecular networks due to the loss of information caused by the condensing of molecular topological properties into a single integer. Various indices, on the other hand, have been utilized to correlate various physicochemical and biological aspects. When it comes to mese indices, one important point to consider is how independent these indicators are from

one another. Because different mathematical procedures [3, 4] are used to obtain distinct topological indices from the structure. Examining the extent of orthogonality among the various indexes is one technique to answer this question. In this article, G be connected simple chemical structure, with $V(G)$ vertices set and $E(G)$ edges set. The degree of any vertex u is denoted by $\widetilde{\Re}(u)$. The edge between vertices u and v is denoted by uv. In present study, we calculate degree based Revan topological indices. Let $\delta(G)$ is the minimum degree and $\Delta(G)$ is the maximum degree in G. The revan degree of vertex u is $r_u = \Delta(G) + \delta(G) - \widetilde{\Re}(G)$.

The topological index evolved from the Wiener index, in 1945, which Wiener defined in 1945 while researching alkane's boiling point [5]. The first degree-based topological index represented by the Milan Randić index is the Randić index [6]. Revan 1st and 2nd topological indices were introduced by Kulli in [7] for study see [8, 9].

$$\begin{aligned} R_1(G) &= \sum_{uv\in E(G)} (r_u + r_v), \\ R_2(G) &= \sum_{uv\in E(G)} (r_u \cdot r_v). \end{aligned} \tag{1}$$

The 1st and 2nd hyper Revan indices were defined by Kulli [10] as follows:

$$\begin{aligned} HR_1(G) &= \sum_{uv\in E(G)} (r_u + r_v)^2, \\ HR_2(G) &= \sum_{uv\in E(G)} (r_u \cdot r_v)^2. \end{aligned} \tag{2}$$

The 1st and 2nd modified Revan indices were introduced by Kulli in [11] as follows:

$$\begin{aligned} mR_1(G) &= \sum_{uv\in E(G)} \frac{1}{(r_u + r_v)}, \\ mR_2(G) &= \sum_{uv\in E(G)} \frac{1}{(r_u \cdot r_v)}. \end{aligned} \tag{3}$$

The sum connectivity Revan index was defined by Kulli in [12].

$$mR_1(G) = \sum_{uv\in E(G)} \frac{1}{\sqrt{(r_u + r_v)}}. \tag{4}$$

The product connectivity Revan index was defined by Kulli in [13].

$$mR_1(G) = \sum_{uv\in E(G)} \frac{1}{\sqrt{(r_u \cdot r_v)}}. \tag{5}$$

The F-Revan was introduced as follows [14]:

$$FR(G) = \sum_{uv\in E(G)} \left(r_u^2 + r_v^2\right). \tag{6}$$

The symmetric division Revan index is defined as follows. The study of [15] used for surface determination of polychlorobiphenyls [16] and formulated as follows:

$$\mathrm{SDD}(G) = \sum_{uv\in E(G)} \left(\frac{r_u}{r_v} + \frac{r_v}{r_u}\right). \tag{7}$$

The Hormonic Revan index is defined as follows [15]:

$$H(G) = \sum_{uv\in E(G)} \frac{2}{r_u + r_v}. \tag{8}$$

Inverse sum Revan index is [15]:

$$I(G) = \sum_{uv\in E(G)} \frac{r_u \cdot r_v}{r_u + r_v}. \tag{9}$$

2. Formation and Result for Amylose Polysaccharide (Chain Structure)

Using the stretcher of Figure 1, we obtained Table 1.

Theorem 1. *The first Revan index of Amylose polysaccharide (chain structure) is*

$$R_1(G) = 36n + 2. \tag{10}$$

Proof 1. Let

$$\begin{aligned} R_1(G) &= \sum_{uv\in E(G)} (r_u + r_v) \\ R_1(G) &= \sum_{1,2\in E(G)} (r_u + r_v) + \sum_{1,3\in E(G)} (r_u + r_v) + \sum_{2,3\in E(G)} (r_u + r_v) + \sum_{3,3\in E(G)} (r_u + r_v) \\ &= (3+2)n + (3+1)(2n+2) + (2+1)(5n-2) + (1+1)4n \\ &= 5n + 4(2n+2) + 3(5n-2) + (2)4n \\ &= 36n + 2. \end{aligned} \tag{11}$$

□

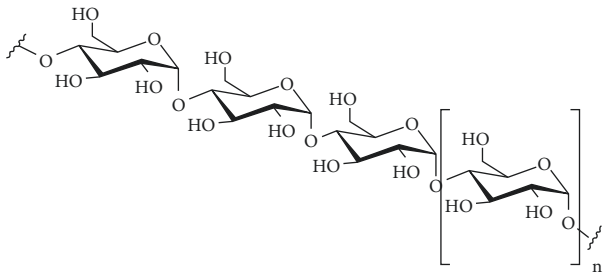


Figure 1: Amylose polysaccharide (chain structure).

Table 1: Degree-based edge partition using Figure 1.

No. of edges	$(1,2)$	$(1,3)$	$(2,3)$	$(3,3)$
Frequency	n	$2n+2$	$5n-2$	$4n$

Theorem 2. *The second Revan index of Amylose polysaccharide (chain structure) is*

$$R_2(G) = 26n + 2. \tag{12}$$

Proof 2. Let

$$\begin{aligned} R_2(G) &= \sum_{uv \in E(G)} (r_u \cdot r_v) \\ R_2(G) &= \sum_{1,2 \in E(G)} (r_u \cdot r_v) + \sum_{1,3 \in E(G)} (r_u \cdot r_v) + \sum_{2,3 \in E(G)} (r_u \cdot r_v) + \sum_{3,3 \in E(G)} (r_u \cdot r_v) \\ &= (3 \cdot 2)(n) + (3 \cdot 1)(2n+2) + (2 \cdot 1)(5n-2) + (1 \cdot 1)(4n) \\ &= 6(n) + 3(2n+2) + 2(5n-2) + (4n) \\ &= 26n + 2. \end{aligned} \tag{13}$$

□

Theorem 3. *The hyper first Revan index of Amylose polysaccharide (chain structure) is*

$$HR_1(G) = 118n + 14. \tag{14}$$

Proof 3. Let

$$\begin{aligned} HR_1(G) &= \sum_{uv \in E(G)} (r_u + r_v)^2 \\ HR_1(G) &= \sum_{1,2 \in E(G)} (r_u + r_v)^2 + \sum_{1,3 \in E(G)} (r_u + r_v)^2 + \sum_{2,3 \in E(G)} (r_u + r_v)^2 + \sum_{3,3 \in E(G)} (r_u + r_v)^2 \\ &= (3+2)^2(n) + (3+1)^2(2n+2) + (2+1)^2(5n-2) + (1+1)^2(4n) \\ &= 25(n) + 16(2n+2) + 9(5n-2) + 4(4n) \\ &= 118n + 14. \end{aligned} \tag{15}$$

□

Theorem 4. *The second hyper Revan index of Amylose polysaccharide (chain structure) is*

$$HR_2(G) = 78n + 10. \tag{16}$$

Proof 4. Let

$$\begin{aligned} HR_2(G) &= \sum_{uv \in E(G)} (r_u \cdot r_v)^2 \\ HR_2(G) &= \sum_{1,2 \in E(G)} (r_u \cdot r_v)^2 + \sum_{1,3 \in E(G)} (r_u \cdot r_v)^2 + \sum_{2,3 \in E(G)} (r_u \cdot r_v)^2 + \sum_{3,3 \in E(G)} (r_u \cdot r_v)^2 \\ &= (3 \cdot 2)^2(n) + (3 \cdot 1)^2(2n+2) + (2 \cdot 1)^2(5n-2) + (1 \cdot 1)^2(4n) \\ &= 36(n) + 9(2n+2) + 4(5n-2) + (4n) \\ &= 78n + 10. \end{aligned} \tag{17}$$

□

Theorem 5. *The modified first Revan index of Amylose polysaccharide (chain structure) is*

$$^{m}R_1(G) = \frac{131}{30}n - \frac{1}{6}. \tag{18}$$

Proof 5. Let

$$\begin{aligned} ^{m}R_1(G) &= \sum_{uv\in E(G)} \frac{1}{(r_u + r_v)}\, ^{m}R_1(G) \\ &= \sum_{1,2\in E(G)} \frac{1}{(r_u + r_v)} + \sum_{1,3\in E(G)} \frac{1}{(r_u + r_v)} + \sum_{2,3\in E(G)} \frac{1}{(r_u + r_v)} + \sum_{3,3\in E(G)} \frac{1}{(r_u + r_v)} \\ &= \frac{(n)}{(3+2)} + \frac{(2n+2)}{(3+1)} + \frac{(5n-2)}{(2+1)} + \frac{(4n)}{(1+1)} \\ &= \frac{131}{30}n - \frac{1}{6}. \end{aligned} \tag{19}$$

□

Theorem 6. *The modified second Revan index of Amylose polysaccharide (chain structure) is*

$$^{m}R_2(G) = \frac{22}{3}n - \frac{1}{3}. \tag{20}$$

Proof 6. Let

$$^{m}R_2(G) = \sum_{uv\in E(G)} \frac{1}{(r_u \cdot r_v)}$$

$$\begin{aligned} ^{m}R_2(G) &= \sum_{1,2\in E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{1,3\in E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{2,3\in E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{3,3\in E(G)} \frac{1}{(r_u \cdot r_v)} \\ &= \frac{(n)}{(3\cdot 2)} + \frac{(2n+2)}{(3\cdot 1)} + \frac{(5n-2)}{(2\cdot 1)} + \frac{(4n)}{(1\cdot 1)} \\ &= \frac{(n)}{6} + \frac{(2n+2)}{3} + \frac{(5n-2)}{2} + (4n) \\ &= \frac{22}{3}n - \frac{1}{3}. \end{aligned} \tag{21}$$

□

Theorem 7. *The harmonic Revan index of Amylose polysaccharide (chain structure) is*

$$HR(G) = \frac{131}{15}n - \frac{1}{3}. \tag{22}$$

Proof 7. Let

$$HR(G) = \sum_{uv\in E(G)} \frac{2}{(r_u + r_v)}$$

$$HR(G) = \sum_{1,2\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{1,3\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{2,3\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{3,3\in E(G)} \frac{2}{(r_u + r_v)}$$

$$
\begin{aligned}
&= \frac{2(n)}{(3+2)} + \frac{2(2n+2)}{(3+1)} + \frac{2(5n-2)}{(2+1)} + \frac{2(4n)}{(1+1)} \\
&= \frac{2(n)}{5} + \frac{(2n+2)}{2} + \frac{2(5n-2)}{3} + (4n) \\
&= \frac{131}{15}n - \frac{1}{3}.
\end{aligned} \tag{23}
$$

□

Theorem 8. *The sum division Revan index of Amylose polysaccharide (chain structure) is*

$$\mathrm{SDR}(G) = \frac{88}{3}n + \frac{5}{3}. \tag{24}$$

Proof 8. Let

$$\mathrm{SDR}(G) = \sum_{uv \in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right]$$

$$
\begin{aligned}
\mathrm{SDR}(G) &= \sum_{1,2 \in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{1,3 \in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{2,3 \in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{3,3 \in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] \\
&= \left[\frac{3}{2} + \frac{2}{3}\right](n) + \left[\frac{3}{1} + \frac{1}{3}\right](2n+2) + \left[\frac{2}{1} + \frac{1}{2}\right](5n-2) + \left[\frac{1}{1} + \frac{1}{1}\right](4n) \\
&= \frac{13}{6}(n) + \frac{10}{3}(2n+2) + \frac{5}{2}(5n-2) + 2(4n) \\
&= \frac{88}{3}n + \frac{5}{3}.
\end{aligned} \tag{25}
$$

□

Theorem 9. *The inverse Revan index of Amylose polysaccharide (chain structure) is*

$$IR(G) = \frac{241}{30}n + \frac{1}{6}. \tag{26}$$

Proof 9. Let

$$IR(G) = \sum_{uv \in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)}$$

$$
\begin{aligned}
IR(G) &= \sum_{1,2 \in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{1,3 \in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{2,3 \in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{3,3 \in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} \\
&= \frac{(3 \cdot 2)}{(3+2)}(n) + \frac{(3 \cdot 1)}{(3+1)}(2n+2) + \frac{(2 \cdot 1)}{(2+1)}(5n-2) + \frac{(1 \cdot 1)}{(1+1)}(4n) \\
&= \frac{6}{5}(n) + \frac{3}{4}(2n+2) + \frac{2}{3}(5n-2) + \frac{1}{2}(4n) \\
&= \frac{241}{30}n - \frac{1}{6}.
\end{aligned} \tag{27}
$$

□

3. Numerical and Graphical Representation

"The numerical and graphical representation of above-computed results are depicted in Figures 2 and 3."

The graphical comparison of topological indices tells us how these are affected by the parameters involved. Furthermore, the behavior of each line tells us about the numerical value of the topological index that depends upon n.

4. Formation and Result of Amylopectin Polysaccharide

Using the stretcher of Figure 4, we obtained Table 2.

Theorem 10. *The first Revan index of Amylopectin Polysaccharide (branched chain) is*

$$R_1(G) = 96n - 58. \tag{28}$$

Proof 10. Let

$$\begin{aligned} R_1(G) &= \sum_{uv \in E(G)} (r_u + r_v) \\ R_1(G) &= \sum_{1,3 \in E(G)} (r_u + r_v) + \sum_{2,2 \in E(G)} (r_u + r_v) + \sum_{2,3 \in E(G)} (r_u + r_v) + \sum_{3,3 \in E(G)} (r_u + r_v) \\ &= (3+1)(9n-4) + (2+2)(1) + (2+1)(12n-10) + (1+1)(12n-8) \\ &= 4(9n-4) + 4(1) + 3(12n-10) + 2(12n-8) \\ &= 96n - 58. \end{aligned} \tag{29}$$

□

Theorem 11. *The second Revan index of Amylopectin Polysaccharide (branched chain) is*

$$R_2(G) = 63n - 36. \tag{30}$$

Proof 11. Let

$$\begin{aligned} R_2(G) &= \sum_{uv \in E(G)} (r_u \cdot r_v) \\ R_2(G) &= \sum_{1,3 \in E(G)} (r_u \cdot r_v) + \sum_{2,2 \in E(G)} (r_u \cdot r_v) + \sum_{2,3 \in E(G)} (r_u \cdot r_v) + \sum_{3,3 \in E(G)} (r_u \cdot r_v) \\ &= (3 \cdot 1)(9n-4) + (2 \cdot 2)(1) + (2 \cdot 1)(12n-10) + (1 \cdot 1)(12n-8) \\ &= 3(9n-4) + 4(1) + 2(12n-10) + (12n-8) \\ &= 63n - 36. \end{aligned} \tag{31}$$

□

Theorem 12. *The hyper first Revan index of Amylopectin Polysaccharide (branched chain) is*

$$HR_1(G) = 300n - 170. \tag{32}$$

Proof 12. Let

$$\begin{aligned} HR_1(G) &= \sum_{uv \in E(G)} (r_u + r_v)^2 \\ HR_1(G) &= \sum_{1,3 \in E(G)} (r_u + r_v)^2 + \sum_{2,2 \in E(G)} (r_u + r_v)^2 + \sum_{2,3 \in E(G)} (r_u + r_v)^2 + \sum_{3,3 \in E(G)} (r_u + r_v)^2 \end{aligned}$$

$$
\begin{aligned}
&= (3+1)^2(9n-4) + (2+2)^2(1) + (2+1)^2(12n-10) + (1+1)^2(12n-8)\\
&= 16(9n-4) + 16(1) + 9(12n-10) + 4(12n-8)\\
&= 300n - 170.
\end{aligned} \tag{33}
$$

□

Theorem 13. *The second hyper Revan index of Amylopectin Polysaccharide (branched chain) is*

$$HR_2(G) = 141n - 68. \tag{34}$$

Proof 13. Let

$$HR_2(G) = \sum_{uv \in E(G)} (r_u \cdot r_v)^2$$

$$
\begin{aligned}
HR_2(G) &= \sum_{1,3 \in E(G)} (r_u \cdot r_v)^2 + \sum_{2,2 \in E(G)} (r_u \cdot r_v)^2 + \sum_{2,3 \in E(G)} (r_u \cdot r_v)^2 + \sum_{3,3 \in E(G)} (r_u \cdot r_v)^2\\
&= (3 \cdot 1)^2(9n-4) + (2 \cdot 2)^2(1) + (2 \cdot 1)^2(12n-10) + (1 \cdot 1)^2(12n-8)\\
&= 9(9n-4) + 16(1) + 4(12n-10) + (12n-8)\\
&= 141n - 68.
\end{aligned} \tag{35}
$$

□

Theorem 14. *The modified first Revan index of Amylopectin Polysaccharide (branched chain) is*

$${}^{m}R_1(G) = \frac{49}{4}n - \frac{97}{12}. \tag{36}$$

Proof 14. Let

$${}^{m}R_1(G) = \sum_{uv \in E(G)} \frac{1}{(r_u + r_v)}$$

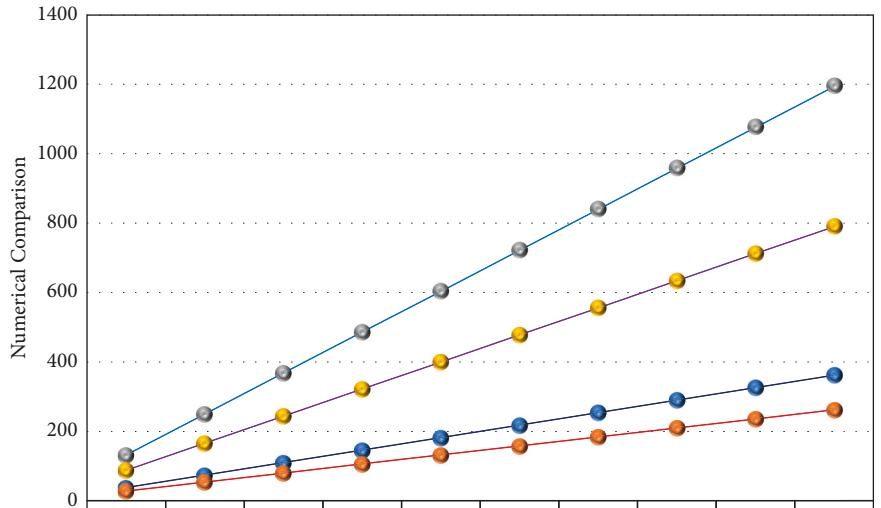
$${}^{m}R_1(G) = \sum_{1,3 \in E(G)} \frac{1}{(r_u + r_v)} + \sum_{2,2 \in E(G)} \frac{1}{(r_u + r_v)} + \sum_{2,3 \in E(G)} \frac{1}{(r_u + r_v)} + \sum_{3,3 \in E(G)} \frac{1}{(r_u + r_v)}$$

$$
\begin{aligned}
&= \frac{(9n-4)}{(3+1)} + \frac{(1)}{(2+2)} + \frac{(12n-10)}{(2+1)} + \frac{(12n-8)}{(1+1)}\\
&= \frac{(9n-4)}{4} + \frac{(1)}{4} + \frac{(12n-10)}{3} + \frac{(12n-8)}{2}\\
&= \frac{49}{4}n - \frac{97}{12}.
\end{aligned} \tag{37}
$$

□

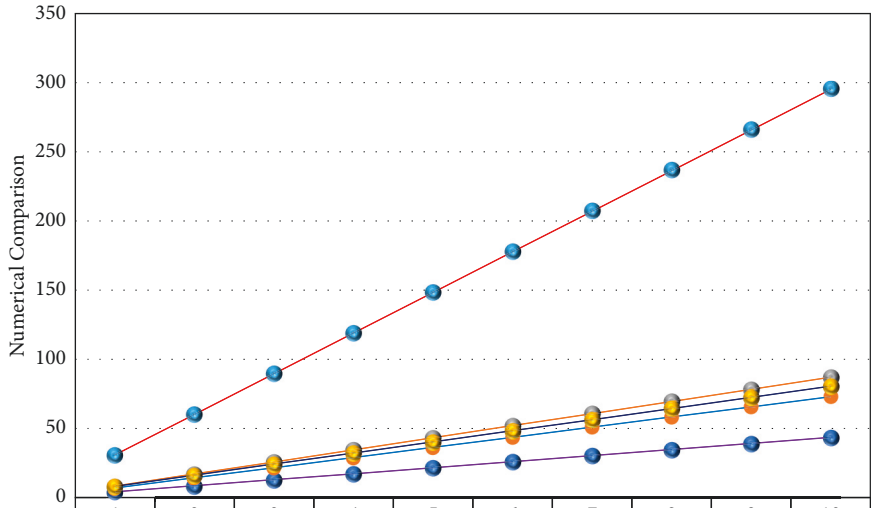
Theorem 15. *The modified second Revan index of Amylopectin Polysaccharide (branched chain) is*

$${}^{m}R_2(G) = 21n - \frac{169}{12}. \tag{38}$$



	1	2	3	4	5	6	7	8	9	10
R_1 (G)	38	74	110	146	182	218	254	290	326	362
R_2 (G)	28	54	80	106	132	158	184	210	236	262
HR_1 (G)	132	250	368	486	604	722	840	958	1076	1194
HR_2 (G)	88	166	244	322	400	478	556	634	712	790

Figure 2: Comparison of $R_1(G)$, $R_2(G)$, $HR_1(G)$ and $HR_2(G)$.



	1	2	3	4	5	6	7	8	9	10
mR_1 (G)	4.2	8.5667	12.933	17.3	21.667	26.034	30.4	34.767	39.134	43.5
mR_2 (G)	7	14.333	21.667	29	36.333	43.66	51	58.333	65.666	73
H (G)	8.4	17.133	25.867	34.6	43.333	52.067	60.8	69.533	78.266	87
I (G)	8.2	16.233	24.267	32.3	40.333	48.367	56.4	64.433	72.466	80.5
SDD (G)	31	60.333	89.667	119	148.33	177.67	207	236.33	265.67	295

Figure 3: Comparison of ${}^{m}R_1(PF)$, ${}^{m}R_2(PF)$, $H(R)$, $I(G)$ and $\mathrm{SDD}(G)$.

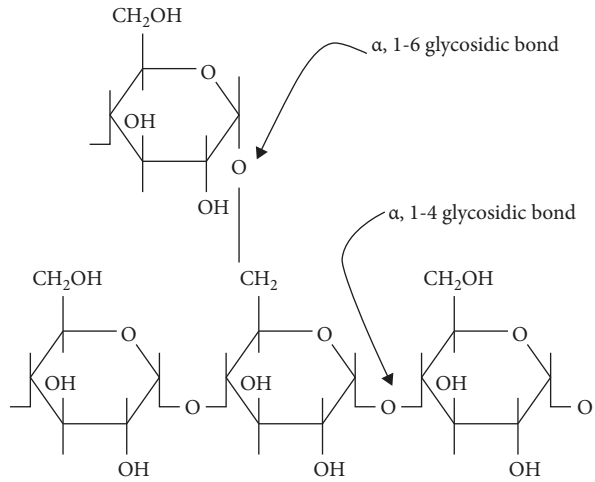
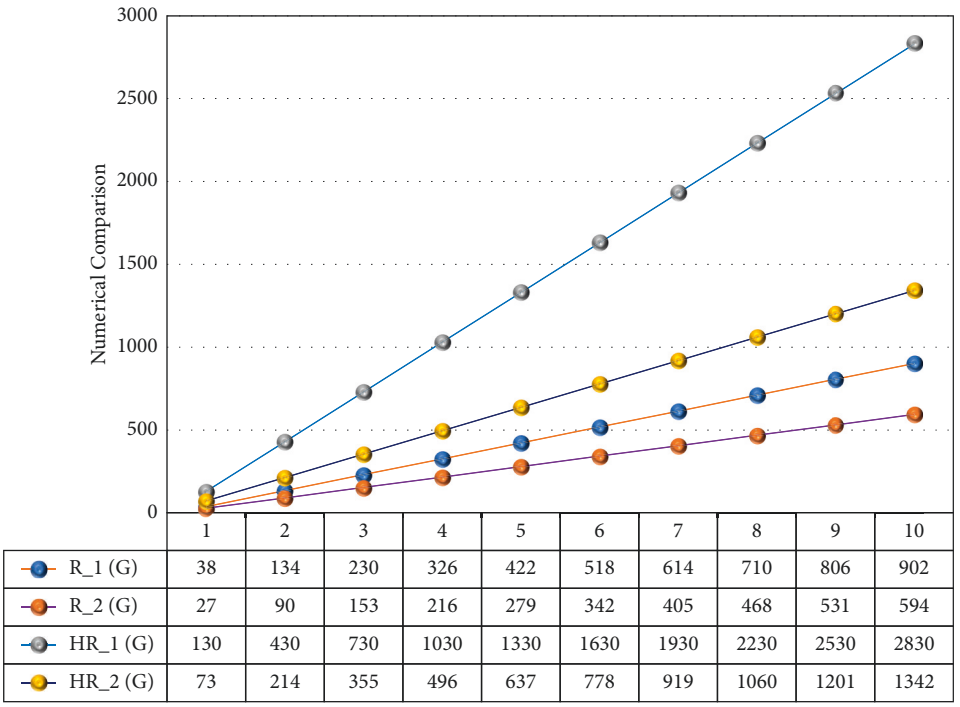


Figure 4: Amylopectin Polysaccharide (branched chain).

Table 2: Degree based edge partition for $n > 1$ using Figure 4.

No. of edges	$(1,3)$	$(2,2)$	$(2,3)$	$(3,3)$
Frequency	$9n-4$	1	$12n-10$	$12n-8$



	1	2	3	4	5	6	7	8	9	10
R_1 (G)	38	134	230	326	422	518	614	710	806	902
R_2 (G)	27	90	153	216	279	342	405	468	531	594
HR_1 (G)	130	430	730	1030	1330	1630	1930	2230	2530	2830
HR_2 (G)	73	214	355	496	637	778	919	1060	1201	1342

Figure 5: Comparison of $R_1(G)$, $R_2(G)$, $HR_1(G)$ and $HR_2(G)$.

Proof 15. Let

$$ {}^{m}R_2(G) = \sum_{uv \epsilon E(G)} \frac{1}{(r_u \cdot r_v)} $$

$$ {}^{m}R_2(G) = \sum_{1,3 \epsilon E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{2,2 \epsilon E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{2,3 \epsilon E(G)} \frac{1}{(r_u \cdot r_v)} + \sum_{3,3 \epsilon E(G)} \frac{1}{(r_u \cdot r_v)} $$

$$= \frac{(9n-4)}{(3\cdot 1)} + \frac{(1)}{(2\cdot 2)} + \frac{(12n-10)}{(2\cdot 1)} + \frac{(12n-8)}{(1\cdot 1)}$$
$$= \frac{(9n-4)}{3} + \frac{(1)}{4} + \frac{(12n-10)}{2} + (12n-8) \tag{39}$$
$$= 21n - \frac{169}{12}.$$

□

Theorem 16. *The harmonic Revan index of Amylopectin Polysaccharide (branched chain) is*

$$HR(G) = \frac{49}{2}n - \frac{97}{6}. \tag{40}$$

Proof 15. Let

$$HR(G) = \sum_{uv\in E(G)} \frac{2}{(r_u + r_v)}$$

$$HR(G) = \sum_{1,3\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{2,2\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{2,3\in E(G)} \frac{2}{(r_u + r_v)} + \sum_{3,3\in E(G)} \frac{2}{(r_u + r_v)}$$
$$= \frac{2(9n-4)}{(3+1)} + \frac{2(1)}{(2+2)} + \frac{2(12n-10)}{(2+1)} + \frac{2(12n-8)}{(1+1)} \tag{41}$$
$$= \frac{2(9n-4)}{4} + \frac{(1)}{2} + \frac{2(12n-10)}{3} + (12n-8)$$
$$= \frac{49}{2}n - \frac{97}{6}.$$

□

Theorem 17. *The sum division Revan index of Amylopectin Polysaccharide (branched chain) is*

$$\mathrm{SDR}(G) = 84n - \frac{157}{3}. \tag{42}$$

Proof 17. Let

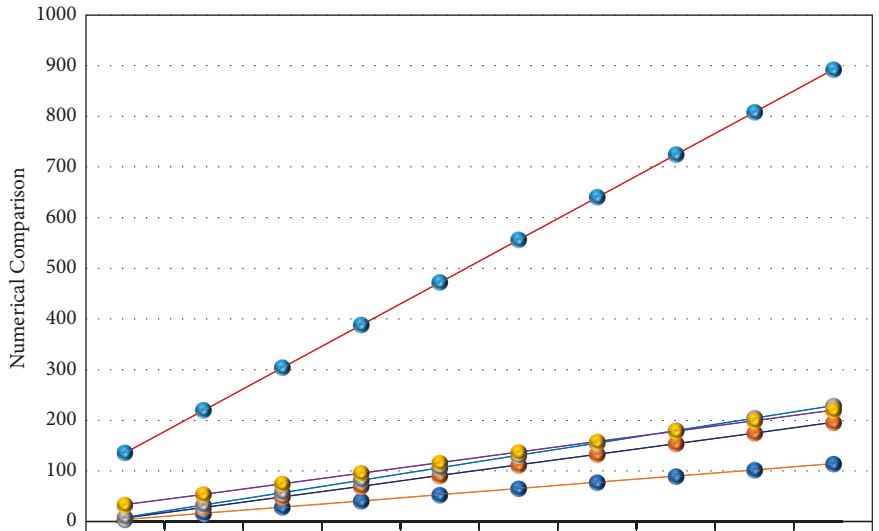
$$\mathrm{SDR}(G) = \sum_{uv\in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right]$$

$$\mathrm{SDR}(G) = \sum_{1,3\in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{2,2\in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{2,3\in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right] + \sum_{3,3\in E(G)} \left[\frac{r_u}{r_v} + \frac{r_v}{r_u}\right]$$
$$= \left[\frac{3}{1} + \frac{1}{3}\right](9n-4) + \left[\frac{2}{2} + \frac{2}{2}\right](1) + \left[\frac{2}{1} + \frac{1}{2}\right](12n-10) + \left[\frac{1}{1} + \frac{1}{1}\right](12n-8) \tag{43}$$
$$= \frac{10}{3}(9n-4) + 2 + \frac{5}{2}(12n-10) + 2(12n-8)$$
$$= 84n - \frac{157}{3}.$$

□

Theorem 18. *The inverse Revan index of Amylopectin Polysaccharide (branched chain) is*

$$IR(G) = \frac{83}{4}n - \frac{38}{3}. \tag{44}$$



	1	2	3	4	5	6	7	8	9	10
mR_1 (G)	4.1667	16.417	28.667	40.917	53.167	65.417	77.667	89.917	102.17	114.42
mR_2 (G)	6.9167	27.917	48.917	69.917	90.917	111.92	132.92	153.92	174.92	195.92
H (G)	8.3333	32.833	57.333	81.833	106.33	130.83	155.33	179.83	204.33	228.83
I (G)	33.417	54.167	74.917	95.667	116.42	137.17	157.92	178.67	199.42	220.17
SDD (G)	136.33	220.33	304.33	388.33	472.33	556.33	640.33	724.33	808.33	892.33

FIGURE 6: Comparison of ${}^{m}R_1(G)$, ${}^{m}R_2(G)$, $H(R)$, $IR(G)$ and $\mathrm{SDD}(G)$.

Proof 18. Let

$$IR(G) = \sum_{uv\in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)}$$

$$IR(G) = \sum_{1,3\in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{2,2\in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{2,3\in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)} + \sum_{3,3\in E(G)} \frac{r_u \cdot r_v}{(r_u + r_v)}$$

$$= \frac{(3\cdot 1)}{(3+1)}(9n-4) + \frac{(2\cdot 2)}{(2+2)}(1) + \frac{(2\cdot 1)}{(2+1)}(12n-10) + \frac{(1\cdot 1)}{(1+1)}(12n-8) \tag{45}$$

$$= \frac{3}{4}(9n-4) + 1 + \frac{2}{3}(12n-10) + \frac{1}{2}(12n-8)$$

$$= \frac{83}{4}n - \frac{38}{3}.$$

□

5. Numerical and Graphical Representation

"The numerical and graphical representation of above-computed results are depicted in the graphical representation are dedicated in Figures 5 and 6."

The graphical comparison of topological indices tells us how these are affected by the parameters involved. Furthermore, the behavior of each line tells us about the numerical value of the topological index that depends upon n.

6. Conclusion

In this manuscript, Revan vertex degree and degree-dependent Revan topological indices of Amylose and Amylopectin Polysaccharides are calculated. The Revan topological indices, for example, are topological descriptors that have been related with various chemical properties of molecules and have been shown to run parallel to preparing the boiling point and Kovats constants of the molecule. The

research presented in this paper allows for a comparative evaluation of numerous topological indices proposed and employed in modern mathematical and theoretical chemistry. We focused our research on a small number of topological indices and only looked at Polysaccharides. Comparing various classes of descriptors (e.g., distance-based, entropies, and eigenvalue-based), comparing topological indices within different classes, and using sets of (molecular) graphs other than Polysaccharides to reach further conclusions are also tasks for the future. Moreover, these indices will be helpful in the analysis of the QSPR/QSAR and are used in the structure of the graph.

Data Availability

The data used to support the study are included in the paper.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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