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Molecular descriptors based comparative QSTR study of saturated alcohols derivatives

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ABSTRACT

In this present work, we have taken saturated alcohol derivatives and comparative QSTR model have been made with the help of few important groups of descriptors like topological, constitutional descriptors, geometrical and getaway descriptors have been tested and to final QSTR model has been made with the help of the most significant descriptors. The values of these descriptors have been calculated by Dragon software. Finally, we have been made direct relationship between most significant descriptors (S_e) and observed toxicity. The cross validation coefficient and correlation coefficient of best model are 0.453139 and 0.852744 respectively.

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KEYWORDS

QSTR;
Topological descriptors;
Constitutional descriptors;
Geometrical descriptors;
Getaway descriptors;
Sum of sanderson electronegativities (Se).

1. INTRODUCTION

Computer simulation techniques have gained significance in bridging the gap between the experimental and theoretical evidence. Modeling macroscopic processes in the realistic environment is one of the most challenging problems in theoretical and computational chemistry. The synthesis of novel pharmacologically active molecules with reduced toxicity is of prime interest. QSAR has gained importance in the field of pharmacological sciences[1]. QSAR methodologies save resources and expedite the process of development of new molecules and drugs. QSAR techniques increase the probability of success and reduce the time and cost involvement in the drug discovery process[2,3]. Success of QSAR not only rests on the development of new drug molecules but also in exploring the toxicological and ecotoxicological characterstics of molecules[4]. Hence Quantitative Structure Toxicity Relationship (QSTR) are predictive tools for a preliminary evaluation of the hazards of chemical compounds by using computer aided models. In our recent communication, we have made a comparative QSTR study on a series of alcohol derivatives[5]. In this present work, we have taken saturated alcohol derivatives and comparative QSTR model have been made. Here, few important groups of descriptors like topological, constitutional descriptors, geometrical and getaway descriptors have been tested and to final QSTR model has been made with the help of the most significant descriptors. Finally, we have been made relationship between most significant descriptors and observed toxicity.

2. EXPERIMENTAL

The different compound of saturated alcohol de-

rivatives have been chosen with their toxicity values[6-9] in terms of 50% inhibitory growth cocentration (IGC50) against tetrahymena pyriformis. T.pyriformis is one of the generally used ciliated protozoa, for laboratory research. In this ciliate species, diverse end points can be used to originate the cytotoxic effects and xenobiotics. Experimental determination of toxicological and biochemical end points as well as the human health end points is a difficult task. Hence QSTR modeling of the toxicity of compounds on the T. pyriformis is vital importance in investigating its toxicity in terms of its 50% inhibitory growth cocentration. For this purpose, all the molecules have been drawn and designed with the help of CAChe pro software in SYBYL Mol2 format.

The following groups of descriptors have been tested to describe the toxicity of the compound and the values of these descriptors have been calculated on Dragon software.

Topological descriptors[10-18]

The following descriptors of this class have been studied: information index in molecular size (ISIZ), total information index of atomic composition (IAC), Mean information index on atomic composition (AAC), first Zagreb index (ZM1), First zagreb index by valence vertex degrees (ZMIV) and Second zagreb index by valence vertex degrees (ZM2).

Constitutional descriptors[19]

The following descriptors of this class have been studied: molecular weight (M_W), average molecular weight (AM_W), sum of atomic vander waals volume (scaled on carbon atom) (SV), sum of atomic sanderson

TABLE 1: Values of topological descriptors, observed toxicity and predicted toxicity

S.no.	Compound name	ISIZ	IAC	AAC	ZM1	ZM1V	ZM2	IGC_{50}	$pIGC_{50}$
1	2-Bromoethanol	28.529	14.92	1.658	10	33.067	8	-0.3538	-1.144
2	2-Chloroethanol	28.529	14.92	1.658	10	33.605	8	-1.5343	-1.144
3	1-Chloro-2-propanol	43.02	18.613	1.551	16	39.605	14	-1.2446	-1.005
4	3-Chloro-1-propanol	43.02	18.613	1.551	14	37.605	12	-1.1622	-1.005
5	4-Chloro-1-butanol	58.603	22.074	1.472	18	41.605	16	-0.5329	-0.774
6	3-Chloro-2,2-dimethyl-1-propanol	75.059	25.395	1.411	28	51.605	28	-0.8568	-0.479
7	6-Chloro-1-hexanol	92.239	28.623	1.363	26	49.605	24	-0.353	-0.136
8	6-Bromo-1-hexanol	92.239	28.623	1.363	26	49.067	24	0.5721	-0.136
9	2,3-Dibromopropanol	69.487	22.658	1.333	26	24.134	26	-0.9264	-0.801
10	Methyl alcohol	15.51	7.51	1.252	2	26	1	-2.6656	-2.402
11	Ethyl alcohol	28.529	11.02	1.224	6	30	4	-1.9912	-2.123
12	1-Propanol	43.02	14.265	1.189	10	34	8	-1.7464	-1.821
13	2-Propanol	43.02	14.265	1.189	12	36	9	-1.8819	-1.821
14	1-Butanol	58.603	17.384	1.159	14	38	12	-1.4306	-1.48
15	(±)-2-Butanol	58.603	17.384	1.159	16	40	14	-1.542	-1.48
16	2-Methyl-1-propanol	58.603	17.384	1.159	16	40	14	-1.3724	-1.48
17	2-Pentanol	75.059	20.429	1.135	20	44	18	-1.1596	-1.101
18	3-Pentanol	75.059	20.429	1.135	20	44	19	-1.2437	-1.101
19	3-Methyl-2-butanol	75.059	20.429	1.135	22	46	21	-0.9959	-1.101
20	tert-Amylalcohol	75.059	20.429	1.135	24	48	22	-1.1729	-1.101
21	2-Methyl-1-butanol	75.059	20.429	1.135	20	44	19	-0.9528	-1.101
22	3-Methyl-1-butanol	75.059	20.429	1.135	20	44	18	-1.0359	-1.101
23	2,2-Dimethyl-1-propanol	75.059	20.429	1.135	24	48	22	-0.8702	-1.101
24	2-Methyl-2-propanol	58.603	17.384	1.159	16	40	14	-1.7911	-1.48
25	1-Hexanol	92.239	23.426	1.116	22	46	20	-0.3789	-0.693
26	3,3-Dimethyl-1-butanol	92.239	23.426	1.116	28	52	26	-0.7368	-0.693
27	4-Methyl-1-pentanol	92.239	23.426	1.116	24	48	22	-0.6372	-0.693
28	1-Heptanol	110.039	26.388	1.099	26	50	24	0.105	-0.264
29	2,4-Dimethyl-3-pentanol	110.039	26.388	1.099	32	56	33	-0.7052	-0.264

TABLE 2: Values of constitutional descriptors, observed toxicity and predicted toxicity

S.n.	Compound name	MW	AMW	S_V	S_P	Se	Ss	IGC_{50}	$pIGC_{50}$
1	2-Bromoethanol	124.97	13.89	5.39	9.22	6.08	11.75	-0.3538	-0.981
2	2-Chloroethanol	80.52	8.95	5.04	9.32	5.59	13.11	-1.5343	-1.496
3	1-Chloro-2-propanol	94.55	7.88	6.64	12.2	7.35	14.94	-1.2446	-1.325
4	3-Chloro-1-propanol	94.55	7.88	6.64	12.2	7.35	14.61	-1.1622	-1.122
5	4-Chloro-1-butanol	108.58	7.24	8.24	15.09	9.11	16.11	-0.5329	-0.747
6	3-Chloro-2,2-dimethyl-1-propanol	122.61	6.81	9.83	17.98	10.86	18.36	-0.8568	-0.918
7	6-Chloro-1-hexanol	136.64	6.51	11.43	20.87	12.62	19.11	-0.353	-0.045
8	6-Bromo-1-hexanol	181.09	8.62	11.78	20.77	13.12	17.75	0.5721	0.036
9	2,3-Dibromopropanol	217.89	18.16	8.07	12.34	9.2	15.83	-0.9264	-0.351
10	Methyl alcohol	32.05	5.34	2.71	6.11	2.97	8	-2.6656	-2.455
11	Ethyl alcohol	46.08	5.12	4.31	8.99	4.73	9.5	-1.9912	-1.987
12	1-Propanol	60.11	5.01	5.9	11.88	6.49	11	-1.7464	-1.783
13	2-Propanol	60.11	5.01	5.9	11.88	6.49	11	-1.8819	-1.783
14	1-Butanol	74.14	4.94	7.5	14.77	8.25	12.5	-1.4306	-1.344
15	(±)-2-Butanol	74.14	4.94	7.5	14.77	8.25	12.83	-1.542	-1.547
16	2-Methyl-1-propanol	74.14	4.94	7.5	14.77	8.25	12.83	-1.3724	-1.547
17	2-Pentanol	88.17	4.9	9.1	17.66	10	14.33	-1.1596	-0.984
18	3-Pentanol	88.17	4.9	9.1	17.66	10	14.33	-1.2437	-0.984
19	3-Methyl-2-butanol	88.17	4.9	9.1	17.66	10	14.75	-0.9959	-1.242
20	tert-Amylalcohol	88.17	4.9	9.1	17.66	10	14	-1.1729	-0.782
21	2-Methyl-1-butanol	88.17	4.9	9.1	17.66	10	14.33	-0.9528	-0.984
22	3-Methyl-1-butanol	88.17	4.9	9.1	17.66	10	14.33	-1.0359	-0.984
23	2,2-Dimethyl-1-propanol	88.17	4.9	9.1	17.66	10	14.75	-0.8702	-1.242
24	2-Methyl-2-propanol	74.14	4.94	7.5	14.77	8.25	13.25	-1.7911	-1.804
25	1-Hexanol	102.2	4.87	10.7	20.55	11.76	15.5	-0.3789	-0.339
26	3,3-Dimethyl-1-butanol	116.23	4.84	12.29	23.43	13.52	17.75	-0.7368	-0.54
27	4-Methyl-1-pentanol	102.2	4.87	10.7	20.55	11.76	15.83	-0.6372	-0.541
28	1-Heptanol	116.23	4.84	12.29	23.43	13.52	17	0.105	-0.08
29	2,4-Dimethyl-3-pentanol	116.23	4.84	12.29	23.43	13.52	18	-0.7052	-0.693

electronegativities (scaled on carbon atom) (Se), sum of atomic polarzibilities (scaled on carbon atom) (Sp) and sum of Kier-Hall electrotopological states (Ss).

Geometrical descriptors[20-29]

The following descriptors of this class have been studied: 3D-Winner index (W3D), 3D-Balban index (J3D), 3D-Haray index (H3D), Average geometric distance degPTe (AGDD), D/D index (DDI) and Average distance/distance degPTe (ADDD).

GETAWAY descriptors[30-32]

The following descriptors of this class have been studied: Total information content on leverage equality (ITH), standardization information content on leverage equality (ISH), mean information content on leverage magnitude (HIC), geometric mean on the leverage magnitude (HGM), H autocorrelation of lag1/unweighted (H1u) and H autocorrelation of lag2/unweighted (H2u).

3. RESULTS AND DISCUSSION

For QSTR study of saturated alcohol derivatives, it was necessary to identify a good tool. The values of four sets of descriptor are included in four TABLES separately (TABLES 1-4). Various QSTR models for each sets of descriptor in different combinations have been developed. The best five model of each sets of descriptor are given below:

^{T}RE1=-0.0068935 ISIZ +0.136864 IAC -3.33807
rCV^2=0.692139 r^2=0.7435

^{T}RE2=0.0262615 ISIZ +2.25453 AAC -5.63154
rCV^2=0.677098 r^2=0.800768

^{T}RE3=0.10897 IAC +0.727589 AAC-4.15129
rCV^2=0.659256 r^2=0.766432

^{T}RE4=0.162379 IAC -0.0431829 ZM1-3.48981
rCV^2=0.697496 r^2=0.76151

^{T}RE5=0.15916 IAC -0.0396817 ZM2-3.55806
rCV 2=0.704589 r^2=0.766028

TABLE 3: Values of geometrical descriptors, observed toxicity and predicted toxicity

S.n.	Compound name	W3D	J3D	3D	AGDD	DDI	ADDD	IGC_{50}	$pIGC_{50}$
1	2-Bromoethanol	86.43	3.694	9.883	19.207	39.502	8.778	-0.3538	-1.276
2	2-Chloroethanol	85.42	3.73	10.003	18.982	39.011	8.669	-1.5343	-1.396
3	1-Chloro-2-propanol	169.39	4.676	15.691	28.232	68.264	11.377	-1.2446	-1.271
4	3-Chloro-1-propanol	176.78	4.506	15.482	29.463	69.254	11.542	-1.1622	-1.142
5	4-Chloro-1-butanol	316.86	5.059	21.296	42.248	108.58	14.477	-0.5329	-0.843
6	3-Chloro-2,2-dimethyl-1-propanol	446.92	6.313	28.882	49.658	152.318	16.924	-0.8568	-0.725
7	6-Chloro-1-hexanol	783.311	5.788	33.561	74.601	215.012	20.477	-0.353	-0.091
8	6-Bromo-1-hexanol	785.881	5.774	33.429	74.846	215.781	20.551	0.5721	-0.027
9	2,3-Dibromopropanol	184.69	4.331	14.213	30.782	72.856	12.143	-0.9264	-0.478
10	Methyl alcohol	27.5	3.01	6.162	9.167	15.352	5.117	-2.6656	-2.525
11	Ethyl alcohol	81.1	3.9	10.989	18.022	36.888	8.197	-1.9912	-1.957
12	1-Propanol	170.63	4.636	16.509	28.438	66.701	11.117	-1.7464	-1.607
13	2-Propanol	170.63	4.636	16.509	28.438	66.701	11.117	-1.8819	-1.607
14	1-Butanol	309.18	5.156	22.34	41.224	105.74	14.099	-1.4306	-1.231
15	(±)-2-Butanol	286.6	5.529	23.093	38.213	102.366	13.649	-1.542	-1.6
16	2-Methyl-1-propanol	288.89	5.517	22.86	38.519	103.965	13.862	-1.3724	-1.394
17	2-Pentanol	472.39	5.92	29.254	52.488	149.338	16.593	-1.1596	-1.195
18	3-Pentanol	476.96	5.851	29.123	52.996	150.712	16.746	-1.2437	-1.036
19	3-Methyl-2-butanol	434.77	6.423	30.432	48.308	146.223	16.247	-0.9959	-1.437
20	tert-Amylalcohol	505.56	5.552	28.405	56.173	153.906	17.101	-1.1729	-0.844
21	2-Methyl-1-butanol	460.15	6.103	29.558	51.128	149.586	16.621	-0.9528	-1.134
22	3-Methyl-1-butanol	463.65	6.056	29.487	51.517	149.751	16.639	-1.0359	-1.129
23	2,2-Dimethyl-1-propanol	439.35	6.402	29.967	48.817	149.42	16.602	-0.8702	-1.086
24	2-Methyl-2-propanol	279.82	5.677	23.179	37.309	103.242	13.766	-1.7911	-1.46
25	1-Hexanol	772.291	5.849	34.621	73.551	211.675	20.16	-0.3789	-0.39
26	3,3-Dimethyl-1-butanol	912.12	7.482	45.189	76.01	263.288	21.941	-0.7368	-0.377
27	4-Methyl-1-pentanol	710.6	6.359	35.857	67.676	205.909	19.61	-0.6372	-0.645
28	1-Heptanol	1119.08	6.081	40.955	93.257	279.05	23.254	0.105	0.175
29	2,4-Dimethyl-3-pentanol	895.53	7.566	47.365	74.627	257.884	21.49	-0.7052	-0.867

In the above regression models, model number 2 is the best model. Which consists of ISIZ and AAC, the cross validations and correlation coefficient is 0.677 and 0.8 respectively, and the predicted toxicity is placed in TABLE 1.

^{G}RE1=-0.105469 M_W+10.6277 S_V-4.92706 Se-0.587344 Ss+6.96706
rCV^2=0.438912 r^2=0.830077

^{G}RE2=32.1159 S_V-2.87901 Se-23.8397 Sp-0.469024 Ss+2.77084
rCV^2=0.467544 r^2=0.83751

^{G}RE3=-0.0447712 MW+26.1038 S_V-3.9987 Se-16.0964 Sp-0.561363 Ss+5.05471
rCV^2=0.463269 r^2=0.841599

^{G}RE4=0.0650289 AM_W+33.0848 S_V-2.73479 Se-24.9567 Sp-0.457403 Ss+2.10189
rCV^2=0.430097 r^2=0.842181

^{G}RE5=-0.0795186M_W+0.110997AM_W+23.0915S_V-4.62153Se-11.9932Sp-0.613194 Ss+5.68544
rCV^2=0.453139 r^2=0.852744

In the above regression models, model number 5 is best model. Which consist of M_W, AM_W, S_V, S_P and S_S, the cross validations and correlation coefficient is 0.453 and 0.852 respectively, and the predicted toxicity is placed in TABLE 2.

^{G}PT1=0.00554877 W3D -1.40673 J3D -0.245488 AGDD +1.18339 ADDD-2.21495
rCV^2=0.577145r^2=0.79313

^{G}PT2=0.00941297 W3D -1.29153 J3D -0.269004 AGDD -0.0170625 DDI +1.29729 ADDD-2.84314
rCV^2=0.554905 r^2=0.795067

^{G}PT3=0.00738207 W3D -0.194848 H3D -0.159052 AGDD +0.00119957 DDI +0.801606 ADDD-4.12025
rCV^2=0.386082 r^2=0.78077

^{G}PT4=-0.964487 J3D -0.0904001 J3D -0.167278 AGDD +0.0282225 AGDD +0.83483 ADDD-2.0947
rCV^2=0.496312 r^2=0.790085

^{G}PT5=0.00802128 W3D -0.998262 J3D -0.0554464 H3D -0.240971 AGDD -0.00718161 DDI +1.16312 ADDD -3.03138
rCV^2=0.345077 r^2=0.796958

In the above regression models, model number 5 is best model. Which consist of W3D, J3D, H3D, AGDD,

TABLE 4: Values of getaway descriptors, observed toxicity and predicted toxicity

No.	Compound name	ITH	ISH	HIC	HGM	H1u	H2u	IGC_{50}	$pIGC_{50}$
1	2-Bromoethanol	8	1	2.922	25.139	0.695	0.05	-0.3538	-1.454
2	2-Chloroethanol	8	1	2.927	25.287	0.711	0.049	-1.5343	-1.455
3	1-Chloro-2-propanol	11.61	1	3.396	20.519	1.113	0.617	-1.2446	-1.341
4	3-Chloro-1-propanol	11.61	1	3.371	19.978	0.891	0.347	-1.1622	-1.161
5	4-Chloro-1-butanol	15.51	1	3.699	16.008	0.969	0.449	-0.5329	-0.726
6	3-Chloro-2,2-dimethyl-1-propanol	17.651	0.898	4.016	12.378	1.612	1.604	-0.8568	-0.847
7	6-Chloro-1-hexanol	24	1	4.184	11.33	1.085	0.762	-0.353	0.114
8	6-Bromo-1-hexanol	24	1	4.182	11.305	1.077	0.751	0.5721	0.122
9	2,3-Dibromopropanol	15.51	1	3.322	19.279	0.868	0.374	-0.9264	-0.719
10	Methyl alcohol	2	1	2.327	34.799	0.374	0.078	-2.6656	-2.287
11	Ethyl alcohol	4.755	1	2.939	25.834	0.79	0.081	-1.9912	-1.857
12	1-Propanol	8	1	3.375	20.275	0.942	0.407	-1.7464	-1.621
13	2-Propanol	8	1	3.375	20.275	0.942	0.407	-1.8819	-1.621
14	1-Butanol	11.61	1	3.706	16.203	1.019	0.506	-1.4306	-1.215
15	(±)-2-Butanol	11.61	1	3.741	17.151	1.298	1.03	-1.542	-1.562
16	2-Methyl-1-propanol	11.61	1	3.735	16.915	1.294	1.039	-1.3724	-1.565
17	2-Pentanol	15.51	1	3.995	14.139	1.347	1.161	-1.1596	-1.157
18	3-Pentanol	15.51	1	3.978	12.978	1.255	0.923	-1.2437	-0.991
19	3-Methyl-2-butanol	13.51	0.871	4.048	14.624	1.619	1.607	-0.9959	-1.27
20	tert-Amylalcohol	15.51	1	3.96	13.127	1.083	0.716	-1.1729	-0.86
21	2-Methyl-1-butanol	15.51	1	3.998	13.947	1.361	1.183	-0.9528	-1.169
22	3-Methyl-1-butanol	15.51	1	3.988	13.987	1.364	1.19	-1.0359	-1.174
23	2,2-Dimethyl-1-propanol	13.51	0.871	4.016	12.667	1.65	1.657	-0.8702	-1.277
24	2-Methyl-2-propanol	9.61	0.828	3.75	15.94	1.512	1.28	-1.7911	-1.392
25	1-Hexanol	19.651	1	4.187	11.396	1.117	0.809	-0.3789	-0.419
26	3,3-Dimethyl-1-butanol	22	0.917	4.438	9.73	1.691	1.833	-0.7368	-0.518
27	4-Methyl-1-pentanol	19.651	1	4.194	11.736	1.406	1.322	-0.6372	-0.751
28	1-Heptanol	24	1	4.374	9.951	1.148	0.908	0.105	0.038
29	2,4-Dimethyl-3-pentanol	24	1	4.438	10.908	1.608	1.674	-0.7052	-0.463

DDI and ADDD, the cross validations and correlation coefficient is 0.345077 and 0.796958 respectively, and the predicted toxicity is placed in TABLE 3.

^{GW}RE1=0.123948 ITH -3.21758 ISH -0.591598 H2u +0.818364
rCV^2=0.654643
r^2=0.76798

^{GW}RE2=0.120587 ITH -3.25358 ISH +0.0639302 HIC -0.621646 H2u +0.688277 rCV^2=0.429161
r^2=0.768197

^{GW}RE3=0.115554 ITH -3.17362 ISH -0.0126019 HGM -0.638932 H2u +1.14417
rCV^2=0.361367
r^2=0.769683

^{GW}RE4=0.117959 ITH -1.39546 HIC -0.105901 HGM -0.166097 H2u +4.3607
rCV^2=0.36025
r^2=0.760248

^{GW}RE5=0.11967 ITH -1.69402 ISH -1.38952 HIC -0.110249 HGM -0.477035 H1u +6.45814
rCV^2=0.313902
r^2=0.769683

In the above regression models, model number 3 is best model. Which consist of ITH, ISH, HGM, and H2u, the cross validations and correlation coefficient is 0.361367 and 0.796958 respectively, and the predicted toxicity is placed in TABLE 4.

All best model of each sets of descriptors are summarized below:

^{T}RE2=0.0262615 ISIZ +2.25453 AAC -5.63154
rCV^2=0.677098 r^2=0.800768

^{C}RE5=-0.0795186 M_W+0.110997 AM_W+23.0915 S_V-4.62153 Se-11.9932 Sp-0.613194 Ss+5.68544
rCV^2=0.453139 r^2=0.852744

^{G}PT5=0.00802128 W3D -0.998262 J3D -0.0554464 H3D -0.240971 AGDD -0.00718161 DDI +1.16312 ADDD -3.03138
rCV^2=0.345077 r^2=0.796958

^{GW}RE3=0.115554 ITH -3.17362 ISH -0.0126019 HGM -0.638932 H2u +1.14417
rCV^2=0.361367 r^2=0.769683

The cross vadiation coefficient, correlation coefficient and number of variables of the above best regres-

TABLE 5 :Relationship between Se and inhibitory growth concentration

Subgroup A		
Compound no.	**Se**	**IGC_{50}**
28	23.43	0.105
7	20.87	-0.353
25	20.55	-0.3789
27	20.43	-0.6372
6	17.98	-0.8568
23	17.66	-0.8702
9	12.34	-0.9264
4	12.20	-1.1622
12	11.88	-1.7464
11	8.99	-1.9912
10	6.11	-2.6656
Subgroup B		
8	20.77	0.5721
21	17.66	-0.9528
15	14.77	-1.542
13	11.88	-1.8819
Subgroup C		
29	2343	-0.7052
19	17.66	-0.9959
16	14.77	-1.3724
2	9.32	-1.5343
Subgroup D		
26	23.43	-0.7368
22	17.66	-1.0359
14	14.77	-1.4306

sion are collectively placed in TABLE 5. A close look at this table indicates that the model no. 5 is the best model among all the four models. Which is derived from constitutional descriptor. The descriptors are M_W, AM_W, S_V, Se, Sv and Ss. So the toxicity of saturated alcohol derivatives are better predict by constitutional descriptors.

Relationship between reactive indices and toxicity

The second TABLE (constitutional descriptors) contains 29 saturated alcohol derivatives and their observed biological toxicity is shown in terms of 50% inhibitory growth concentration. The toxicities along with reactive indices are given in TABLE 2. A close look at this TABLE indicates that the toxicity increases by the addition of halo group (-Cl or Br) and toxicity decreases by the decreasing the carbon chain in homologous series. . In this TABLE we showed that the relationship between toxicity and sum of Sanderson electronegativities (Se) and are placed in TABLE 5. Examination of this TABLE shows that the biological toxicity is directly proportional to sum of Sanderson electronegativities (Se). When sum of Sanderson electronegativities is decreases, toxicity decreases but there is no sequential rise or fall. In order to provide sequential relationship this TABLE has been divided into three subgroup A, B, and C. Subgroup A contain ten compounds, subgroup B and C contain eight and five compounds respectively. Compound **(1, 3, 5, 17, 18, 20)**, and **(24)** do not fallow sequential trend.

Concluding remark

In this present article we have been made QSTR model of 29 alcohol derivatives with the help of four group of descriptors, viz, topological descriptors, constitutional descriptors, geometrical descriptors and GETAWAY descriptors. The best group of descriptors are constitutional descriptors. The cross validation and correlation coefficient of best model, which is derived by constitutional descriptors, are 0.453139 and 0.852744 respectively. There is direct relationship between reported biological toxicity and sum of sum of Sanderson electronegativities (Se). of twenty nine derivatives of alcohol. The sum of sum of Sanderson electronegativities (Se). can alone be helpful for searching alcohol of desired toxicity.

4. REFERENCES

[1] Y.G.Smeyers, L.Bouniam, N.J.Smeyers, A. Ezzamarty, A.Hernandez-Laguna, C.I.Sainz-Diaz; Eur.J.Med.Chem., 33, 103-112 **(1998)**.

[2] F.Choplin, Computers and the medicinal chemist, C.Hansch, P.G.Sammes, J.B.Taylor; 'Comprehensive Medicinal Chemistry', Pergamon Press, Oxford, **4**, 33-58 **(1990)**.

[3] R.Franke; 'Theoretical Drug Design Methods', Elsevier, Amsterdam, **(1984)**.

[4] D.R.Roy, R.Parthasarathi, B.Maiti, V.Subramanian, P.K.Chattaraj; Bioorg.Med.Chem., **13(10)**, 3405-3412 **(2005)**.

[5] A.K.R.Khan, V.K.Sahu; International Journal of Quan.Chem., 108 **(2008)**.

[6] L.H.Hall, T.A.Vaughn; Med.Chem.Res., **7**, 407-416 **(1997)**.

[7] T.W.Schultz; Toxicol.Methods, **7**, 289-309 **(1997)**.

[8] K.S.Akers, G.D.Sinks, T.W.Schultz; Environ. Toxicol.Pharmacol., **7(1)**, 33-39 **(2003)**.

[9] S.D.Dimitrov, O.G.Mekenyan, G.D.Sinks, T.W. Schultz; J.Mol.Struct.Theochem., **622**, 63-70 **(2003)**.
[10] H.Narumi; MATCH, Comm.Math.Comp.Chem., **22**, 195-207 **(1987)**.
[11] D.E.Needham, I.C.Wei, P.O.Seybold; J.Am.Chem. Soc., **110**, 4186-4194 **(1988)**.
[12] (a) L.Pogliani; J.Phys.Chem., **100**, 18065-18077 **(1996)**.
(b) J.R.Platt; J.Chem.Phys., **15**, 419-420 **(1947)**.
[13] (a) I.Gutman; J.Chem.Inf.Comput.Sci., **34**, 1037-1039 **(1994)**.
(b) B.Ren, J.Chem.Inf.Comput.Sci., **39**, 139-143 **(1999)**.
[14] S.Gupta, M.Singh, A.K.Madan; J.Chem.Inf. Comput.Sci., **39**, 272-277 **(1999)**.
[15] H.Wiener; J.Am.Chem.Soc., **69**, 17-20 **(1947**
[16] O.Ivanciuc, T.S.Balaban, A.T.Balaban; Math. Chem., **12**, 309-318 **(1993)**.
[17] D.Amic, N.Trinajstic; Croat.Chem.Acta, **68**, 53-62 **(1995)**.
[18] A.T.Balaban; Chem.Phys.Lett., **89**, 399-404 **(1982)**.
[19] R.Todeschini, V.Consonni; 'Handbook of Molecular Descriptors', Wiley-VCH, Weinheim, Germany, **(2000)**.
[20] M.Randic; Int.J.Quantum.Chem.Quantum.Biol. Symp., **15**, 201-208 **(1998)**.
[21] S.Nikolic, N.Trinajstic, Z.Mihalic, S.Carter; Chem. Phys.Lett., 179, 21-23 **(1991)**.
[22] M.V.Diudea, D.Horvath, A.Graovac; J.Chem.inf. Comput.Sci., **35**, 129-135 **(1995)**.
[23] A.T.Balaban; J.Chem.inf.Comput.Sci., **37**, 645-650 **(1997)**.
[24] O.Mekenyan, D.Peitchev, D.Bonchev, N.Trinajstic, I.P.Bangov; Arzneim.Forsch., **36**, 176-183 **(1986)**.
[25] Z.Mihalic, S.Nikolic, N.J.Trinajstic; Chem.inf. Comput.Sci., **32**, 26-37 **(1992)**.
[26] M.Randic, A.F.Kleiner, L.M.DeAlba; J.Chem.inf. Comput.Sci., **34**, 277-286 **(1994)**.
[27] A.R.Katritzky, L.Mu, V.S.Lobanov, M.Karelson; J.Phys.Chem., **100**, 10400-10407 **(1996)**.
[28] C.Tanford; Physical Chemistry of Macromolecules, Wiley, New York (NY), **(1961)**.
[29] M.V.Volkenstein; 'Configurational Statistics of Polymeric Chains', Wiley-Interscience, New York (NY), **(1963)**.
[30] V.Consonni, R.Todeschini, W.Sippl; 'Approaches to Drug Design', Prous Science, Barcelona, Spain, 235-240 **(2001)**.
[31] V.Consonni, R.Todeschini, M.Pavan; J.Chem.Inf. Comp.Sci., **42**, 682-692 **(2002)**.
[32] V.Consonni, R.Todeschini, M.Pavan, P.Gramatica, V.Consonni, R.Todeschini, M.Pavan; J.Chem.Inf. Comp.Sci., **42**, 693-705 **(2000)**.