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STUDY OF THE BIOLOGICAL ACTIVITY OF DI(PARA-AMINOPHENYL-1,3,4-OXADIAZOLTHION-2)GOSSYPOL SCHIFF BASE AGAINST CANCER, HERPES, AND ZIKA VIRUSES USING THE AUTODOCK TOOLS SOFTWARE

Annotation

In this study, we investigated the biological activity of di(para-aminophenyl-1,3,4-oxadiazolthione-2)gossypol Schiff's base against cancer, herpes, and Zika viruses using AutoDock Tools.

Keywords: Gossypol, para-aminophenyl-1,3,4-oxadiazolthione-2, Schiff base, molecular docking, cancer, herpes, Zika, protein, ligand, binding energy.

ИССЛЕДОВАНИЕ БИОЛОГИЧЕСКОЙ АКТИВНОСТИ ДИ(ПАРА-АМИНОФЕНИЛ-1,3,4-ОКСАДИАЗОЛТИОН-2)ГОССИПОЛ ШИФФА БАЗЫ ПРОТИВ РАКА, ГЕРПЕСА И ВИРУСОВ ЗИКА С ИСПОЛЬЗОВАНИЕМ ПРОГРАММЕ AUTODOCK

Аннотация

В данном исследовании мы изучали биологическую активность ди(пара-аминофенил-1,3,4-оксадиазолтион-2)госсипола в основании Шиффа в отношении рака, герпеса и вирусов Зика с использованием метода молекулярного докинга с помощью программы AutoDock Tools.

Ключевые слова: Госсипол, пара-аминофенил-1,3,4-оксадиазолтион-2, основание Шиффа, молекулярный докинг, рак, герпес, Зика, белок, лиганд, энергия связывания.

DI(PARA-AMINOFENIL-1,3,4-OKSADIAZOLTION-2)GOSSIPOL SHIFF ASOSINING SARATON, GERPES VA ZIKA VIRUSLARIGA NISBATAN BIOLOGIK FAOLLIGINI AUTODOCK TOOLS DASTURI YORDAMIDA O'RGANISH

Annotatsiya

Ushbu izlanishimizda di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosining saraton, gerpes va zika viruslariga nisbatan biologik faolligini AutoDosk Tools dasuri yordamida o'rgandik.

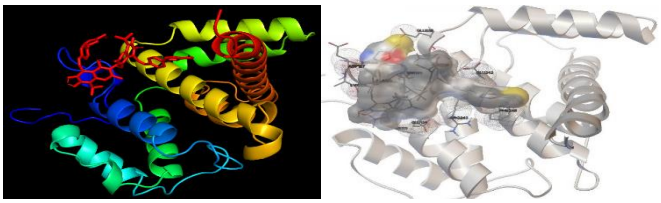
Kalit so'z: Gossipol, para-aminofenil-1,3,4-oksadiazoltion-2, Shiff asosi, Molekulyar doking, saraton, gerpes, zika, oqsil, ligand, bog'lanish energiyasi.

Kirish. Hozirgi kunda butun dunyo bo'yicha keng tarqalib borayotgan bir qancha virusli kasalliklarga nisbatan, biologik faol bo'lgan modalarni aniqlash, ajratib olish va sintez qilish hamda kvant kimyoviy kompiyuter dasturlari bo'yicha nazariy jihatdan hisoblashlar o'tkazish ommaviy tus olgan [1-3]. Shu jumladan Molekulyar doking dasturi kimyoviy modda(ligand)larning virus oqsili bilan bog'lanishi yoki yaqinliligini hisoblash orqali bog'lanish energiyasini aniqlashga asoslangan [4-6]. Dastur oqsil va ligandning funksional guruhlarini hisobga olgan holda eng optimal fazoviy strukturasini yaratish orqali bu ikki molekula o'rtasidagi o'zaro ta’sir energiyalari orqali bog'lanish energiyasini hisoblaydi. Bog'lanish energiyasini aniqlash jarayoni quyidagi 2 ta asosiy bosqichni o'z ichiga oladi:

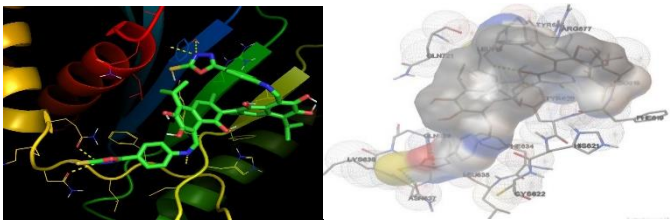
a) oqsil va ligandning konformatsiyasini yaratish
b) hosil bo'lgan konformatsiyaning bog'lanish yaqinligini aniqlash [7-8]

Bog'lanish energiyasi–oqsil va ligand o'rtasidagi o'zaro ta’sir kuchini aniqlash uchun ishlatiladigan Molekulyar doking dasturining asosiy parametri hisoblanadi. Bog'lanish energiyasi virus oqsilining, ligand retseptori bilan bog'langanda sodir bo'ladigan energiya o'zgarishini hisoblaydi va kilokaloriya(kkal/mol) yoki kilojoul(kJ/mol) larda ifodalaydi [9-10].

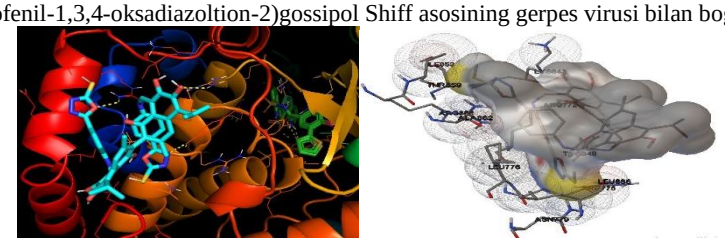
Olingan natijalar tahlili. Gossipolning para-aminofenil-1,3,4-oksadiazoltion-2 bilan hosil qilgan Shiff asosining biologik faolligini Molekulyar doking dasturida aniqlash maqsadida, hozirgi kunda havfli bo'lgan saraton, gerpes hamda zika virusli kasalliklari tanlab olindi. Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosi saraton, gerpes hamda zika viruslariga nisbatan biologik faolligi Molekulyar doking dasturi bo'yicha AutoDock Tools usuli yordamida o'rganilib natijalar olindi.



1-rasm. Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosining saraton virusi bilan bog'lanish konformatsiyasi



2-rasm. Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosining gerpes virusi bilan bog'lanish konformatsiyasi



3-rasm. Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosining zika virusi bilan bog'lanish konformatsiyasi

Yuqoridagi rasmlardan ko'rinib turibdiki, ligand oqsil tarkibidagi aminokislotalar bilan bog'lanish hosil qiladi.

Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosi bilan vodorod bog'lanishda ishtirok etgan hamda ishtirok etmagan saraton, gerpes va zika viruslarining oqsili tarkibidagi aminokislotalar aniqlandi.

1-jadval

Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipolning oqsil va ligand o'rtasidagi vodorod bog'lanishda ishtirok etgan va ishtirok etmagan aminokislotalar

T/r	Sarton		Gerpes		Zika	
1	bog'langan	bog'lanmagan	bog'langan	bog'lanmagan	bog'langan	bog'lanmagan
	Aminokislotalar		Aminokislotalar		Aminokislotalar	
2	SER130	ASP127	TYR505	ARG577		THR859
3	GLU242	SER126	GLY639	LEU618		ARG358
4		GLU235	ASN637	LEU635		ALA862
5		ASN239		LYS638		LYS843
6		VAL131		PHE634		ARG772
7		GLU136		CYS622		LEU776
8		ARG242		HIS621		LEU886
9		PHE246		TYR620		ASN779
10		LYS120				ARG775
11						TYR840

Dastur oqsil va ligand sutrukturasining optimal fazoviy tuzilishini aniqlab, bog'lanish mumkin bo'lgan va bog'lanish uchun minimal energiya talab qiladigan oqsil+ligand konformatsiyasini hosil qiladi.

Oqsil va ligand o'rtasida yuzaga kelgan bog'lanish energiyasini – vodorod bog'lanish energiyasi, Van-der-valls energiyasi, elektrostatik energiyasi hamda erish nergiyalari qiymatlarining yig'indisi hosil qiladi.

Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosining saraton, gerpes hamda zika viruslari bilan hosil qilgan bog'lanish energiyasi(kJ/mol) Molekulyar doking dasturining AutoDock Tools usulida aniqlandi. 2-jadval.

2-jadval

Di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipolning oqsil va ligand o'rtasidagi bog'lanish energiyasi (ΔG, kkal/mol)

T/r	Saraton	Gerpes	Zika
1	-6.28	-5.88	-6.81
2	-5.26	-4.99	-4.74
3	-4.33	-4.31	-4.30
4	-3.74	-3.29	-3.83
5	-3.49	-3.24	-2.96
6	-3.37	-3.13	-2.23
7	-3.29	-2.49	-2.10
8	-1.99	-2.42	-1.45
9	-1.61	-1.59	-0.81
10	-0.61	-1.15	+0.22

Molekulyar doking dasturi ligandning oqsil strukturasi bilan bog'lanishini, bog'lanish energiyasi eng kichik qiymatlarga ega bo'ladigan 10 hil oqsil+ligand konformatsiyasini yaratish bilan amalga oshiradi. Ligandning bog'lanish energiyasi qanchalik kichik bo'lsa, biologik aktivligi shunchalik yuqori bo'ladi.

Xulosa. Gossipolning para-aminofenil-1,3,4-oksadiazoltion-2 bilan hosil qilgan Shiff asosini Molekulyar doking dasturining AutoDock Tools usulida saraton, gerpes va zika viruslariga nisbatan bog'lab o'rganildi. Bog'langan va bog'lanmagan aminikoslotar aniqlandi. Saraton hamda gerpes virusi tarkibida bog'langan aminokislotalar mavjudligini, zika virusi tarkibida esa bog'langan aminokislotalar mavjud emasligini ko'rishimiz mumkin. 2-jadvalda keltirilgan ma’lumotlar asosidida di(para-aminofenil-1,3,4-oksadiazoltion-2)gossipol Shiff asosi saraton va gerpes virusiga qaraganda zika virusiga nisbatan biologik faol ekanligini, bog'lanish energiyasining kichik qiymatga ega ekanli bilan tushuntiriladi.

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