PEGANUM HARMALA L. O'SIMLIGINING TUZILISHI, TERAPEVTIK FAOLLIGI VA FITOKIMYOVIY TARKIBI

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Annotatsiya: Ushbu maqolada mamlakatimizda keng tarqalgan Peganum harmala L. o'simligining botanik xususiyatlari, tuzilishi, o'simlikni turli kasalliklarni davolashda amaliy tatbiqi, uning turli ta'sir etuvchi biologik faol moddalari - alkaloidlar, flavonoidlar, antraxinonlar, moylar va boshqa birikmalar xaqida keng ma'lumotlar keltirilgan. Ayrim birikmalarning tuzilishlari va qo'lllash boyicha tushunchalar keltirilgan.

Kalit so'zlar: Peganum harmala L., Zigophyllaceae, garmin, garmalin, flavonoid, bakterisid, antivirus, modda, kasallik, o'simlik.

Аннотация: В статье приведены обширные сведения о ботанических свойствах и строении растения Peganum harmala L., широко распространенного в нашей стране, практическом применении растения при лечении различных заболеваний, а также о содержащихся в нем различных биологически активных веществах – алкалоидах, флавоноидах, антрахинонах, маслах и других соединениях. Представлены структуры и области применения некоторых соединений.

Ключевые слова: Peganum harmala L., Zygophyllaceae, гармин, гармалин, флавоноид, бактерицидный, противовирусный, вещество, болезнь, растение.

Abstract: The article provides extensive information on the botanical properties and structure of the plant Peganum harmala L., widespread in our country, the practical use of the plant in the treatment of various diseases, as well as on the various biologically active substances it contains - alkaloids, flavonoids, anthraquinones, oils and other compounds. The structures and areas of application of some compounds are presented.

Keywords: Peganum harmala L., Zygophyllaceae, harmine, harmaline, flavonoid, bactericidal, antiviral, substance, disease, plant.

Kirish

P. harmala L. - Zygophyllaceae (ayrim manbaalarda Nitrariaceae) oilasiga kiradi. Xalqimiz tomonidan "isiriq" deb nomlangan va qadimdan turli maqsadlarda qo'llangan o'simlik. P. harmala asosan, Yaqin Sharq, Shimoliy Afrika va Markaziy Osiyoda uchraydi. O'simlik odatda achchiq ta'mi tufayli hayvonlar tomonidan o'tlanmaydi. P. harmala, may-iyul oylarida gullaydigan, dashtlarda o'sadigan,

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kuchli o'ziga xos hidli, balandligi 40-70 sm bo'lgan ko'p yillik otsu o'simlik. Ildizi ko‘p boshli, yog‘ochsimon, yo‘g‘on (diametri 3—5 sm. Poyasi shoxlangan, qiyshiq, yalang‘och, zich bargli. Barglari o‘simtasimon, navbatma-navbat joylashgan, uzunligi 4—5 sm, eni 5—6 sm, tagiga uch qirrali, bo‘laklari ham chiziqsimon bo‘laklarga bo‘lingan. Gullari oq, elliptik, odatda uzunligi 10-13 mm. Mevasi diametri 0,6-1 sm bo'lgan uch hujayrali kapsula, mevalari iyun oyining oxiridan avgustgacha pishadi. Urug'lari to'q qora rangda, uzunligi 1-2 mm (1-rasm). P. harmala xalqimiz orasida avvaldan keng qo’llanib kelaniyotgan o’simlik bo’lganligi uchun, unuing tarkibini aniqlash, ajratilgan moddalar qaysi sinflarga mansubligi, o’simlikni amaliy qo’llanish soxalari xaqida turli manbaalarda tarqoq xolda keltirilgan dunyo olimlarining batafsil, ilmiy asoslangan izlanishlari bilan tanishishni va jamlangan sharx ko’rinishiga keltirishni maqsad qilib olindi.

ADABIYOTLAR TAHLILI. Axoli orasida P. harmala butun holatida tutatqi sifatida ishlatiladi. Urug'lar tarkibida rang beruvchi moddalar va 14,25% yog'li moy ham mavjud. Uning urug'i va ildizidan olingan bo'yoq mato va junni qizil rangga bo'yashda ishlatiladi. P. garmala mevazi tabiiy ravishda mavjud bo'lgan joylarda an'anaviy tibbiyot tizimida turli kasalliklarni davolash uchun tez-tez ishlatiladi [1]. Uning mevazi an'anaviy tibbiyotda antiseptik va og'riq qoldiruvchi vosita sifatida ishlatiladi [2]. Bundan tashqari, qustiruvchi [3], giyohvandlik [4], antigelmintik [5, 6], antiperiodik va antispazmotik [7], gipoglikemik [8], antigistamin [9], vazorelaksant [10], immunomodulyator [11], shishga qarshi [12], gepatoprotektiv [13], analjezik [14], sitotoksik [15], antioksidant [16], antispazmodik [17], antispazmodik [18], antimutagen [19] va antioksidant [20] kabi ko'plab farmakologik xususiyatlarga ega. P. garmala sariq [21], sanchishi [22-24], astma [25] kabi ko'plab kasalliklarni davolashda va ogohlantiruvchi sifatida ishlatilgan [26]. Tibbiy maqsadlarda o’simlik yer ustki qismi va urug'lari ishlatiladi. Peganum harmala L. dan olingan deoksipeganin gidroxlorid preparati antixolinesteraz xossaga ega va turli xil miya kasalliklari miyopatiya va miyasteniyalarni davolashda, shuningdek, surunkali ich qotishi va kelib chiqishi turlicha bo’lgan ichak atoniyasi davolash uchun ishlatiladi. Peganum harmala L. urug'lari tarkibidagi garmin epidemik ensefalit, titroq falaj va Parkinson kasalligining oqibatlarini davolash uchun tavsiya etilgan. Xalq tabobatida Peganum harmala L. ning bug’latmalarilari va qaynatmalari shaklida markaziy asab tizimini tinchlantiruvchi, og'riq qoldiruvchi, yallig'lanishga qarshi, antigelmintik, antiseptik va siydik haydovchi sifatida ishlatiladi.

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a)

b)

c)

d)

1-rasm. Peganum harmala L. o‘simligi: a)bargi, b)guli, c)mevazi, d) urug’i.

Fungitsid faollik. P. harmala ning antifungal ta'siri turli patogen zamburug'larda ko'rsatildi. 50-500 mkg/ml konsentratsiyada garmin, garmalin va ularning hosilalari bilan 16 zamburug'ni Sabouraud dekstrozli agar (Oksoid) qiyalarida sinovdan o'tkazdi va MIClar bilan solishtirish uchun ingibisyon zonalarini qayd etdi [27-35].

Antivirus faollik. P. harmala ning turli xil hayvonlar viruslari va o'simliklar viruslariga ingibitiv ta'siri haqida xabar berilgan. Ishida usulidan foydalanib, β-karbolin , dihidro-β-karbolin va tetrahidro-β-karbolin alkaloidlari va ularning hosilalarining anti-TMV faoliyatini sinab ko'rdi. Barcha alkaloidlar va ularning ba'zi hosilalari in vitro va in vivo ribaviringa qaraganda yuqori anti-TMV faolligini ko'rsatishi aniqlandi. Xususan, harmalan (60,3%) va tetradidroarmane (59,5%) ning in vitro va in vivo faolligi 500 mkg/ml dagi ribaviringa (38,5%) nisbatan ancha yuqori edi [36, 37].

P. harmala urug'idan pegaharin A-F ning HSV-2ga qarshi faolligini ikkita vakillik β-karbolin alkaloidlari (garmin va garmalin) bilan solishtirdi. Pegaharine D IC_{50} qiymati 2,12 ± 0,14 mkM bo'lgan ushbu birikmalarning eng kuchli antibakterial faolligini ko'rsatdi [38-42].

P. harmala ning turli komponentlarining virusga qarshi faolligi haqida xabar berilgan. Tadqiqotlarning aksariyatida faqat P. harmala ning virusga qarshi ekstraktlari haqida xabar berilgan, ammo ekstraktlarda antivirus birikmalarni skrining qilish bo'yicha tadqiqotlar kamdan-kam uchraydi va P. harmala virusga qarshi mexanizmi bo'yicha tadqiqotlar kamroq. Shu sababli, ushbu jihatlar bo'yicha hali ham ko'proq tadqiqotlar talab etiladi.

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Boshqa bir ishda, P. harmala urug'i (PHS) ekstrakti PR8 (H1N1) gripp virusiga qarshi terapevtik ta’sir etdi. PHS ekstrakti oseltamivirga o'xshash antivirus ta'sirga ega (20 mg/kg). 200 mg/kg PHS ni og'iz orqali yuborish tana vaznining yo'qolishini kamaytirdi va omon qolish tezligini oshirdi [43].

Asiklovir kabi nukleosid analoglaridan foydalanish HSV-2 tomonidan kelib chiqqan herpes simplex virusi (HSV) infektsiyasini (jinsiy aloqa orqali yuqadigan genital gerpes) davolash uchun keng tarqalgan. Shunga qaramay, ortiqcha foydalanish chidamli shtammlarning o'sishiga olib keladi. P. harmala urug'larining geksan, diklorometan va etil asetatdan (metanol ekstraktidan tashqari) ekstraktlarining hech biri virusning kirib borishi paytida va undan keyin to'g'ridan-to'g'ri aloqa qilish bilan virus replikatsiyasini to'liq sekinlashtirga erishmadi, ammo bu ekstrakt hujayralarni oldindan davolash uchun ishlatilganda faollik kuzatilmadi. Bundan tashqari, Vero hujayralaridagi metanol ekstrakti sezilarli sitotoksiklikni ko'rsatmadi. Garmin va asiklovir birikmalarining kombinatsiyasi HSV-2 replikatsiyasiga qarshi sinergetik ta'sirga ega ekanligi aniqlandi [44].

Antiparazit faollik. P. harmala ning sezilarli antiparazit faolligi isbotlangan. Hamster modeli orqali garminning turli shakllarining antileishmanial faoliyatini o'rgangan. Garminning erkin, lipozoma, vesikulyar va nanoartikulyar shakllari taloqning parazitar yukini mos ravishda taxminan 40%, 60%, 70% va 80% ga kamaytirishi aniqlandi. Oqim sitometriyasi yordamida hujayra siklini tahlil qilish shuni ko'rsatdiki, garmin hujayra bo'linish bosqichiga xalaqit beradi va konfokal mikroskopiya hujayra o'limiga o'ziga xos bo'lmagan membrana shikastlanishi sabab bo'lgan [45-47].

P. harmala urug'i ekstrakti patogenlarga yaxshi ingibitiv ta'sir ko'rsatdi va ba'zi protozoalarni sekinlashtirgan, bu ba'zi hollarda ijobiy nazorat dori-darmonlaridan ustun edi. Biroq, uning ta'sir qilish mexanizmi bo'yicha bir nechta tadqiqotlar mavjud va uning samaradorligining moddiy asoslari etarli darajada aniq emas. Urug'lar gallyutsinogen va gipotermik xususiyatlarga ega. Pishgan mevalar pishmagan mevalarga qaraganda ko'proq alkaloidlarga ega. P.garmala, shuningdek, mog'or va suv o'tlari kabi turli parazitlarni, shuningdek, turli bakterial shtammlarni o'ldirish uchun tutun shaklida ham qo'llaniladi. Peganum harmala urug'larining fitokimyoviy tekshiruvi flavonoidlar, kumarin va qatronlar yo'qligini, alkaloidlar, saponinlar, taninlar, glikozidlar, antraxinonlar, terpenoidlar va steroidlar mavjudligini ko'rsatdi. Peganum harmala va uning alkaloidlari in vitro antibakterial faolliklari bemorlardan ajratilgan Streptococcus, Staphylococcus, Aeromonas, E.coli, Klebsiella, Acinetobacter patogen bakteriya shtammlariga nisbatan aniqlangan [48].

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Saratonga qarshi faollik. P. harmala saraton hujayralarining o'sish tezligini kamaytirish orqali saratonning ayrim turlarining rivojlanishiga ta'sirini sekinlashtirishi isbotlangan. MDA-MB-231 ko'krak bezi saratoni hujayralarining apoptozi tahlili uchun Annexin-V-fluosdan foydalanish P. harmala urug'i ekstrakti hujayralar ta'sir qilish vaqtiga va konsentratsiyasiga qarab o'sish sur'atlarining pasayishiga olib kelganligini ko'rsatdi. 30 mkg/ml konsentratsiya nafaqat o'sish tezligini pasaytirdi, balki deyarli 24 soat ichida hujayralarning 50 foizini apoptozga duchor qildi. Bundan tashqari, P. harmala urug'i ekstrakti hujayralarning tashqi yo'l bilan qo'zg'atilgan apoptozini keltirib chiqarganligi ham qayd etildi. Dezoksipeganin, garmin va peganin birikmalari saraton hujayralarining ko'p dori-darmonlarga chidamliligi ingibitori sifatida sinovdan o'tkazildi, ammo ular MDR1 gen bilan transfektsion sichqoncha limfoma hujayra liniyasiga qarshi muvaffaqiyatli bo'lmadi, hatto eng yuqori dozasi 40 mkg/ml [49].

Neyroprotektiv faollik. Asetilxolinesteraza ingibitorlari (AChEI) Altsgeymer kasalligini davolash uchun ishlatiladi. Yupqa qatlamli xromatografiya (TLC, bioautographic tahlil) qo'llangan tadqiqot P. nigellastrum urug'ining metanol ekstraktlari muhim ingibitiv ta'sirga ega ekanligini ko'rsatdi. Faqat 0,01 mkg garmin, garmalin, harmol va galatamin (ular AChE ingibitorleri sifatida tanilgan) AChE ni sekinlashtirgan. Shuningdek, AChE faolligini sekinlashtirish uchun 0,1 mkg vasisin va harmol konsentratsiyasi etarli edi. Vasitsinon, deoksivasitsinon, deoksivasin va nigelastrinlar I va II past AChEI ta'sirini (1 mkg) ko'rsatdi. Shuning uchun, P. nigellastrum alkaloidlari AChE ingibitori sifatida foydalanish uchun yuqori potentsialni taqdim etdi [50].

Butirilxolinesteraza (BChE) ingibitori faolligi pastroq bo'lsa-da, Peganumdan olingan harman alkaloidi eng kuchli AChE ingibitori faolligiga ega ekanligini isbotladi. Xuddi shunday, garmin va garmalin AChE va zaif BChE ingibitörlerinin faolligini muhim sekinlashtirgan. Boshqa tomondan, harmalol va harmol kuchliroq BChE ingibitori faolligini ko'rsatdi, ammo o'rtacha AChE ingibitori faolligini ko'rsatdi. Bundan tashqari, nigelastrin I va nigellastrine II ko'proq qattiq BChE ingibitör faolligini berdi, lekin yomon AChE ingibitör faoliyati natijalari. Hammasidan farqli o'laroq, vasisin AChE va BChE ni sekinlashtirishda ta'sir ko'rsatdi. Alkaloidning yangi turi - 2-aldegid-tetrahidrogarmin olingan [51].

Antioksidant va mikroblarga qarshi faollik. P. harmala urug'idan tozalangan oqsilning (132 kDa) antioksidant qiymatini baholash uchun metanolik DPPH (2,2-difenil-1-pikrilhidrazil) eritmasiga bir necha konsentratsiyali oqsil qo'shildi. Natijada, oqsilning antioksidant faolligi C vitaminining antioksidant faolligiga o'xshash edi [52].

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P. harmala urug'i ekstrakti garmalin va garmin asosidagi IC0 qiymati 27 mkg/L bo'lgan kuchli monoamin oksidaza (MAO-A) ingibitiv faolligini ko'rsatdi, ildiz ekstraktining IC50 qiymati esa faqat garmin asosida 159 mkg/L ni tashkil etdi. P. harmala urug'idan beta-karbolinning antibakterial va antifungal faolligi bo'yicha yana bir tadqiqot alkaloidlar ikkilik aralashmalar sifatida qo'llanilganda ijobiy ingibitiv o'zaro ta'sirga ega ekanligini ko'rsatdi. Misol uchun, garmin Proteus vulgaris (24,7 mm), Bacillus subtilus (21,2 mm) va Candida albicans (22,2 mm) ga qarshi eng kuchli ingibisyon zonasini ko'rsatdi, E. coli va Aspergillus niger esa 20,8 mm gacha bo'lgan ingibisyon zonalari bilan harmanga eng sezgir ekanligi aniqlandi. Bundan tashqari, garmalin qo'llanganda P. vulgaris (22,6 mm) va C. albicans (21,3 mm) ga qarshi kuchliroq ingibisyon zonalari aniqlangan. Biroq, harmolinni qo'llash o'rtacha faoliyatni taqdim etdi [53]. Pyezoelektrik purkash usulidan foydalangan holda, tadqiqotda P. harmala urug'ining ekstrakti Aliivibrio fischeri ga eng ko'p antibakterial ta'sir ko'rsatganligi ko'rsatilgan [54].

Yaraga qarshi faollik. P. harmala urug'idan olingan peganin gidroxloridi kalamushlarda sovuqqa chidamli, aspirin, spirtva pilorik bog'lash natijasida kelib chiqqan oshqozon yarasi modellariga qarshi uning yaraga qarshi faolligini aniqlash uchun qo'llanildi. Ushbu tadqiqotga ko'ra, peganin gidroxloridning yaraga qarshi faolligi kalamushlarda sezilarli bo'lgan. Shuningdek, peganin gidroxlorid alkogolda himoya, aspirinda potentsial sitoprotektiv va pilorik bog'lanishda erkin va umumiy kislotalilik uchun palliativ ekanligi aniqlandi [55].

Miya faoliyatiga faollik. Garminning ikki xil dozasi kalamushlarda sinovdan o'tkazildi. Garmine qisqa muddatli ishlash va yaqinda xotirada sezilarli yaxshilanishni ko'rsatdi. Boshqa tomondan, garminning 1 va 5 mg dozalari fazoviy mos yozuvlar xotirasiga ta'sir ko'rsatmadi va yuqori dozani qo'llash ushbu kalamushlarning ko'pchiligida motor etishmovchiligini keltirib chiqardi [56].

Tizza osteoartritiga faollik. Platsebo-nazorat ostida bo'lgan sinov (RCT) to'rt haftalik davolanishdan so'ng og'riq, qattiqlik, noziklik va funktsiyani boshqarishda P. harmala moyining standartlashtirilgan preparatining samaradorligini ko’rsatdi [57].

Dermatozlarda faollik. Misrda o'tkazilgan klinik sinov P. harmala ning ko'plab teri kasalliklarida antibakterial va antiprotozoal faolligini baholadi [58].

Gastroezofagial saratonga qarshi faollik. Uchta tadqiqotda P. harmala va Dracocephalum kotschyi Boiss gastroezofagial saratoni bilan og'rigan bemorlarda Spinal-Z ning terapevtik va salbiy hodisalari uning asosiy komponentlari sifatida baholandi. Standart davolash bilan birgalikda palliativ terapiya sifatida qo'llaniladi. Dastlabki tadqiqot to'qqiz oylik kuzatuv davomida yuqori oshqozon-ichak traktida saraton bilan kasallangan etti bemorda Spinal-Z ga javobni baholadi [59].

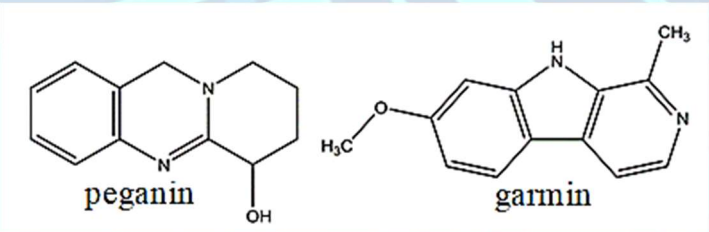
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TADQIQOT METODOLOGIYASI. Maqola sharx ko'rinishida bo'lganligi uchun ob'ektga tegishli bo'lgan materiallarni jamlash, saralash, qayta ishlash va qiyosiy taxlil qilish metodlaridan foydalanildi.

MUHOKAMA VA NATIJALAR. Alkaloidlarning miqdoriy tarkibi o'simlikni o'sishining geografik joylashuviga sezilarli darajada bog'liq. P. harmalada keng tarqalgan asosiy fitokimyoviy birikmalar - alkaloidlar, uglevodlar va flavonoidlar xisoblanadi. P. harmala alkaloidlarning umumiy miqdori 2 dan 5% gacha o'zgarib turadi. Shuningdek, yosh ildizlarda eski ildizlarga nisbatan deyarli ikki barobar ko'p alkaloidlar borligi aniqlangan. Alkaloidlar ichida miqdor bo'yicha garmin ustunlik qiladi. Ildizda 1,5-3,5%, barglarda 1-5%, gullarda 2-3%, meva kapsulalarida 1-1,5%, urug'larda 2,8-5% alkaloidlar mavjud. Peganum harmala L. zaharli o'simlik bo'lib, uning zaharliligi tarkibida alkaloidlarning sezilarli miqdori bilan bog'liq. O'simlik rivojlanishi bilan yer ustki qismida alkaloidlar umumiy miqdori kamayadi, jumladan peganinning ulushi kamayadi, garmin miqdori ortadi [60, 61].

P. harmala dan 308 dan ortiq birikmalar ajratilgan, ulardan 97 tasi alkaloidlar, 24 tasi flavonoidlar, 10 tasi triterpenoidlar, 3 tasi antraxinonlar, 2 tasi fenilpropanoidlar, 18 tasi uglevodlar, 17 tasi aminokislotalar, 99 tasi uchuvchi yog'lar, 26 yog 'kislotalari, 3 sterol, 1 vitamin, 1 oqsil, 1 karotin va 6 boshqa mikroelementlar. Ushbu birikmalar orasida eng yuqori tarkib β-karbolin alkaloidlaridir. Ularning asosiy birikmalariga garmin, garmalin, harmalol, harman va harmol kiradi [62]. P. harmala urug'laridan asosiy birikmalar: dodekan, tetradekan, metildodekanoat, geksadekan, 2-oktanol benzoat, geptadekan, metil tetradekanoat, 2,6,10,14-tetrametilpentadekan, oktadekan, 2,6,10,14-tetrametilheksadekan, nonadekan, metil heksadekanoat, dibutil ftalat, eikosan, metil oleat, henikosan, dokosan, garmin va trikosan.

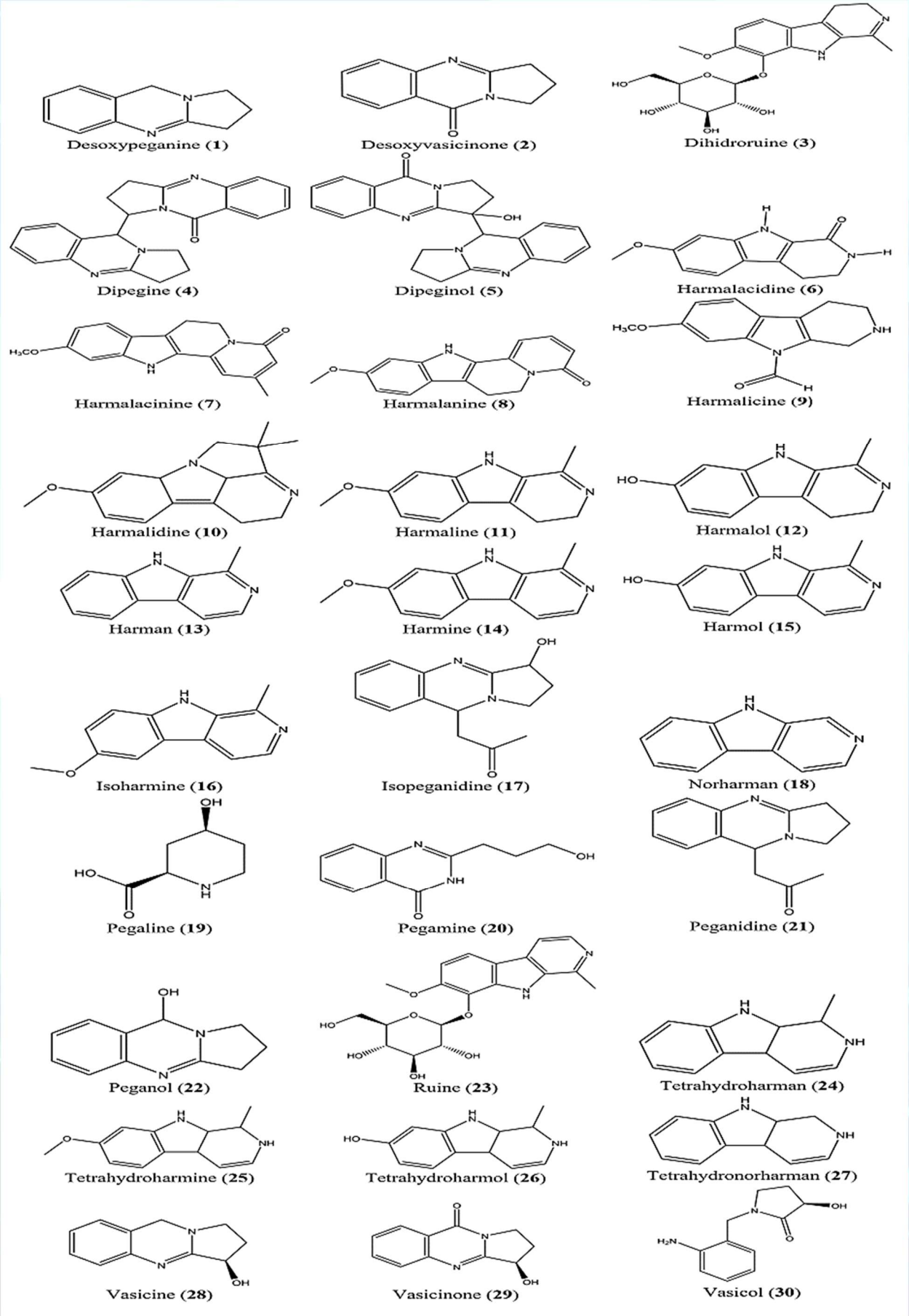
P. harmala qismlaridan asosan xinazolin va β-karbolin sinfi alkaloidlari ajratilgan, masalan peganin va garmin (2-rasm).



2-rasm. Xinazolin va β-karbolin alkaloidlari: peganin va garmin.

P. harmala ekstrakti asosiy β-karbolin alkaloidlari garmin, garmalin, garmalol, garmol va tetragidrogarmin xisoblanadi. Xom ashyo tarkibida kamida 1,5% alkaloidlar mavjud. Ildizlarning asosiy alkaloidi garmindir [63].

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3-rasm. P. harmala tarkibidagi ayrim alkaloidlar strukturalari

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P. harmala o'zining alkaloid tarkibi bilan ko'proq ma'lum bo'lib, u ikki guruhga bo'linadi: β-karbolin va xinazolin alkaloidlari (3-rasm). Ajratilgan bir qancha alkaloidlar orasida β-karbolin alkaloidlariga garmin, garmalin, harmol, harmalol, harman, norharman, tetrahidrogarmin, tetrahidroharmol, tetrahidroharman, tetrahidronorharman, izogarmin, harmalatsidin, harmalidin, harmalitsin, harmalanin, rumalanin, rumalalin va boshqalar mansub, xinazolin alkaloidlariga esa vazisin (peganin), vazisinon, dezoksipeganin, dezoksivazisinon, peganol, vazikol, pegamin, pegalin, peganidin, izopeganidin, dipegin, dipeginol va boshqalar mansub [64].

P. harmala tarkibida flavonoidlardan - rutin, luteolin, apigenin, akatsetin 7-O-ramnozid, 7-O-6"-O-glyukozil-2"-O-(3'"-atsetilramnozil) glyukozid, 7-O-(2'"-O-ramnozil-2') va glikoflavon 2'"-O-ramnozil-2"-O-glyukozilsitizozid, kversetin-3-*O*-gentiobiozid, kversetin -3- *O*-rutinozid, kaempferol-3- metoksil -5- *O*-rutinozid, kaempferol-3,5-dimethyxyl-7- *O*-glyukozid; stearic acid; kaempferol-3-metoksil-7-*O*—glyukozid, isorhamnetin-7-*O*-glukozid, izorhamnetin-3-*O*-rutinozid va boshqalar aniqlangan [61, 65, 66].

P. harmala tarkibida 105 ta monoterpenlar va kislorodli seskviterpenlar aniqlangan. Efir moylarning asosiy komponenti evgenol ekanligi ko’rsatilgan. Bularga - p-simen, limonen, n-oktanol, linalool, izoborneol, terpinen-4-ol, naftalin, α-terpinol, 1-dodesen, β-kubben, n-undekanol, 6,8-nonadien-2-on, (E)-β-ionon, (E)-metil izoeugenol, dodekan kislota, spatulenol, n-tetradekanol, longifolol, farnesol, lanceol va boshqalar kiradi [67].

P. harmala tarkibida shuningdek spirtlar, aldegidlar, ketonlar, uglevodorodlar, saxaridlar, efirlar, kislotalar, aminokislotalar, galogenli birikmalar va boshqa sinf moddalar aniqlangan [61].

Yuqorida keltirilgan P. harmala o’simligi bo’yicha ma’lumotlar asosida quyidagilarni ko’rsatishimiz mumkin:

1). O’simlik tarkibidagi alkaloidlar va terpenlar antivirus, antiparazit, bakteritsid, fungitsid xossalari namoyon qiladi.

2) Tarkibdagi flavonoidlar va alkaloidlar miya faoliyatini yaxshilashga yordam beradi.

3) Efir moylari bakteritsidlik xossalarini belgilaydi, bundan tashqari asal yig’ish uchun asalarilarni chorlashda yordam beradi.

XULOSA VA TAKLIFLAR. Peganum harmala o’simligi boy tarkibga egaligi sababli mahalliy xalqlar tomonidan qadimdan turli kasalliklarni davolashda asosli ravishda foydalanib kelingan. Xozirgi vaqtda turli etimologiyadagi kasalliklar oldini olish va davolashda ilmiy asoslangan xolda sintetik preparatlar bilan birgalikda Peganum harmala dan foydalanish metodlarini ishlab chiqish va

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tatbiq etish lozim. Peganum harmala preparatlarning afzalligi uning tabiiyligi, organizmga qo'shimcha salbiy ta'sirlarning kamligi va xom-ashyo manbaalarining qayta tiklanuvchanligi xisoblanadi. Ayniqsa, "organik dexqonchilikda" isiriq preparatlaridan insektisid, bakterisid va fungitsid sifatida foydalanish maqsadga muvofiq.

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