TUT IPAK QURTIDA GETROZIS VA UNING AHAMIYATI

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ANNOTATSIYA

Ushbu maqolada tut ipak qurtida geterozis va uning ahamiyati haqida, geterozis jarayoni ummumiy tushunchasi, ahamiyati, qanday hayvonlarda foydalanish mumkinligi, bu soha bo'yicha biologiya fani oldida erishilgan yutuqlar haqida ma'lumotlar keltirilgan.

Kalit so'zlar; Geterozis, tut ipak qurti, tur, Bombyx Mori, geterozis tahlili, duragay, biologik, morfologik.

ABSTRACT

This article provides information about the heterosis of the silkworm and its meaning, about the general concept of the heterosis process, its meaning, about which animals it can be used in, about achievements in this field before biological science.

Keywords: heterosis, silkworm, species, Bombyx Mori, heterosis analysis, hybrid, biological, morphological.

KIRISH

Dunyoda ipak qurtining 3000 dan ortiq zotlari mavjud. Bu zotlar monovoltin, bivoltin yoki polivoltindir [45,46]. Monovoltin va bivoltin zotlari polivoltinga nisbatan sifat va miqdoriy xususiyatlari ustundir, ammo polivoltin zotlari o'zlarining yashash va chidamliligi bo'yicha nisbatan ustunroq [47]. Tut ipak qurti ham ilmiy tadqiqotlar uchun mukammal hashoratlar turlaridan biri hisoblanadi [24].

Geterozis jarayoni barcha seleksioner olimlarni tashvishga solmoqda. Ammo getrozisning mexanizmi noma'lumligicha qolmoqda. Geterozis bu genetik jihatdan bir-biridan farq qiladigan ikkita individning chatishuvi natijasida olingan F_1 ning belgi-xususiyatlari ota-onadan ustun bo'lish hodisasi hisoblanadi.

Jahonda ipakchilikni rivojlantirish tendensiyasi, jumladan, so'nggi o'n yillikda ipak ishlab chiqarishda katta natijalarga erishilgan. Bunda ipakchilik va bivoltin duragaylarning rivojlanishi muhim rol o'ynaydi. Ipak qurtining yuqori mahsuldorli zot va

duragaylarining yaratilishi sifatli ipak xomashyosi ishlab chiqarish hajmini oshirishga, ipakchilik tarmog‘ining barqarorligini taminlashga so‘zsiz hissa qo‘shmoqda. Asosan ipakchilik bo‘yicha yetakchi davlatlarda ko‘plab bivoltinli duragaylar xalqaro standartlariga javob bermaydigan chekka subtropik va mo’tadil tropik hududlarida yetishtiriladi.

ADABIYOTLAR TAHLILI VA METODOLOGIYA

Tut ipak qurti yetishtirish dasturning asosiy maqsadi hosildorlikni oshirish va genetik ko’rsatkichlarini yaxshilash hisoblanadi [1]. Genetik ko‘rsatkichlarini yaxshilash kerakli genlarni tegishli kombinatsiyalarda birlashtirishdan iborat. Ipakchilik ikkita alohida strategiyadan tuzilgan, ya’ni, kelgusi avlodlarda miqdoriy va sifat belgilarni tanlash yo‘li bilan inbred tizmalarni yaratish hamda tijoriy maqsadlar uchun mos duragaylarni tanlash. Bu ikki maqsadga ipak qurti turli rasalarida ota-onalikning keng, xilma-xil va aniq divergent genofondlar yaratilgandagina erishiladi. Shunda duragay yuqori darajadagi geterozis imkoniyatlarini namoyon etadi [2]. Biologiya sohasidagi duragaylar belgi-xususiyat juda kuchli bo‘lib borishi isbotlangan. Bu haqda Darvin 1859- yilda o‘zining “Turlarning kelib chiqishi” kitobida aytib o‘tgan. Geterozis atamasi yunoncha “heteros” va “osis” so‘zlaridan olingan. Buni chatishtirishda zotlarning ustunligini tavsiflash uchun 1914-yilda Shull tomonidan ishlab chiqilgan [3]. Bu hodisa birinchi marta 1763-yilda [4] Koelreuter tomonidan o‘rganilgan va uni duragay kuchga nisbatan deb atagan.

Genetik jihatdan geterozis – bu bir yoki bir nechta parametrlari bo‘yicha farq qiluvchi komponentlarning chatishuvi natijasida hosil bo‘lgan duragayning ota-onalarga nisbatan funksiyasi. Ipak qurti bo‘yicha Yaponiyalik mutaxassis Toyamaning (1906), F_1 duragaylarini duragaylash va tijorat maqsadlarida yetishtirish bo‘yicha ilg‘or ishlar ipakchilik tarixida yangi davr bo‘ldi. Yaponiya fermerlari 1919-yilga kelib ishlab chiqarilgan ipak qurti tuxumning 90% dan ortig‘i duragaylardan olingan bo‘lib, 1928-yilga kelib bu ko‘rsatkich 100 % ga yetdi [5]. Yapon olimlari ipakchilikda duragay quvvatidan foydalanishni birinchi marta 1906-yilda amalga oshirdilar [43]. Duragay quvvati bu irsiy o‘zgaruvchalikning yig‘ilishi va rekombinatsiyasi natijasi hisoblanib, sifat va miqdoriy belgilarda namoyon bo‘ladi. Tut ipak qurtida ipak hosildorligiga o‘zaro bog‘langan 21 ta xususiyat yordam beradi [44].

Geterozisning tasnifi

Nittler [6] tomonidan ko‘rib chiqilgan geterozisning har xil turlari individual, onalik va otalik geterozisi sifatida tasniflanadi. Individning uning ota-onasining o‘rtacha ko‘rsatgichiga nisbatan

unumdorligi, kuch-quvvati va boshqalarning yaxshilanishi natijasida kelib chiqadigan, ota-onalik yoki reproduktiv xususiyatlariga ta'siriga bog'liq bo'lmagan geterozis individual geterozis deb atalib, populatsiyadagi geterozis esa bu bilan bog'liq.

Chandrasekharaiah [7] ipak qurtidagi geterozisni muvozanatli, mutatsiyali va psevdogeterozis deb tasniflangan. Atrof muhitning yanada qulay sharoitlaridan kelib chiqadigan geterozis psevdogeterozis yoki soxta geterozis deb ataladi. Ko'pincha ipakchilikdagi xomashyo – ipak ishlab chiqarish uchun ishlatiladigan duragaylash haqiqiy geterozis bilan bog'liq.

Sarkar Makkey [8] ga ko'ra geterozis yo'nalishi (ijobiy geterozis + foydali yoki manfiy geterozis - foydali bo'lmagan) yoki funksiyasiga (lyuks, adaptiv, selektiv geterozis), qarab tasniflanishi mumkinligini aytgan.

Geterozisning nazariy asoslari

Geterozisning namoyon bo'lishini tushuntirish uchun bir nechta nazariyalar taklif qilingan bo'lib, ular Bowman [9] tomonidan ko'rib chiqilgan. Nazariyalar quydagilar:

a) Dominatlik nazariyasi;

Dominantlik nazariyasi ota-ona tizmasi turli qulay lokuslar bo'yicha gomozigota dominant ekanligini ta'kidlaydi. Bu nazariya taklif qilingan dominant allellarning retsessiv allellardan ustunligining asosidir. Dominant nazariyasi shuni takidlaydiki, ma'lum bir tizmadagi qarindosh-urug'lar ba'zi retsessiv genlari F_1 da geterotik ta'sir ko'rsatadigan boshqa tizmaning dominant genlari tomonidan geterozisni keltirib chiqarib "niqoblanadi" (Reddy va Raju 1998) [10].

b) O'ta-dominantlik nazariyasi;

Haddan tashqari hukmronlik nazariyasi geterozigotaning gomozigotadan ustun ekanligini ta'kidlaydi. Buning turli versiyalari orasida "o'tageterozis nazariyasi" xromosoma darajasida o'ta ustunlik yoki haddan tashqari dominantlik va "fiziologik muvozanat nazariyasi" [11] mavjud. Ko'pincha dominantlik va o'tadominantlik nazariyasi bir xil kutilmalarga olib keladi. Ikkala holatda ham naslchilikdan ko'ra ko'tarilish va naslchilikda duragay kuchining yo'qolishining kamayishi aniqlanadi.

c)Epistaz nazariyasi;

Epistaz nazariyasi u o'zaro ta'sirning barcha turlarini o'z ichiga oladi. Sheridon [12] epistatik nazariya "F_1 epistaz" yoki "ota-ona epistazlari" deb nomlagan. Biroq epistazning nasl-nasabining geterozisga qo'shgan hissasi odatda ahamiyatsiz deb hisoblanadi [13].

Hayman and Mather [14] dominant modifikatsiyalari, dominat epistaz retsessiv epistaz, dublikator genlar, retsessiv

suppressor va komplementar genlar kabi genetik o‘zaro ta’sirning har xil turlari uchun umumlashtirilgan formalari haqida xabar berishdi. Bundan tashqari, ular geterozis bir-birini to‘ldiruvchi yoki takrorlanadigan genlarning o‘zaro ta’sirining yakuniy mahsuloti ekanligini ta’kidladilar.

d) Biokimyoviy nazariya;

Biokimyoviy nazariya geterozisning biokimyoviy asoslari geterotik ta’sir ipak qurtining rivojlanish siklining dastlabki qismida asosiy faolligi qayd etilgan tartibga soluvchi oqsillar va gormonlar kabi o‘sish moddalari bilan bog‘liq. Geterotik duragayning mitoxondriyalarda yuqori metabolitik samaradorlik kuzatiladi, geterozisga ega bo‘lmaganlarda bunday o‘zgarishlar kuzatilmaydi.

Geterozis va atrof-muhit ekologik omillari

Ipak qurtinining o‘sishi va rivojlanishiga ta’sir ko‘rsatish ma’lum bo‘lgan geterozisni ifodalashda juda muhim rol o‘ynaydi. O‘zaro zotli populatsiyada ifodalanadigan geterozis darajasi genotip va o‘sha paytdagi muhit omillari o‘rtasidagi o‘zaro ta’sir bilan belgilanadi. Lerner [15] genetik gomeostaz kontsepsiyasini taklif qildi, bunda geterozigota populyatsiyalar gomozigotali populyatsiyalarga nisbatan atrof-muhit omillaridan kamroq ta’sirlanishi kuzatiladi. Sang [16], Griffmg and Zsiros [17], Knight [18] va Orozoco [19] geterozigot populyatsiyalar gomozigotlarga qaraganda atrof-muhitning salbiy omillariga yaxshiroq bardosh berish uchun zarur bo‘lgan genetik arxitekturaga ega ekanligi aniqlangan.

Odatda yaxshi muhitda optimal harorat, nisbiy namlik, havo oqimi, parvarish maydoni, mikrobsiz sharoitlar va yuqori oziqaviy qiymatga ega tut barglari ipak qurtining ota-ona zotlari yuqori hosil beradi [20]. Boshqa tomondan, ota-ona avlodlari ham, duragaylari ham noqulay sharoitda o‘stirilganda duragaylarning o‘rtacha ko‘rsatkichi ota-ona zotlarining o‘rtacha qiymatidan yuqori bo‘ladi. O‘rtacha ota-ona qiymatiga nisbatan geterozis darajasi qulay muhit sharoitida asosan kamroq bo‘ladi. Agar ota-ona zotlari ham duragaylari ham noqulay ekologik sharoitda o‘stirilganda, duragaylarning ishlashi ikkala ota-ona komponentlariga qaraganda ancha yuqori bo‘ladi.

Geterozis va pillachilik; naslchilikning asosiy maqsadi

Naslchilikning asosiy maqsadi-duragaylash, so‘ngra ma’lum manbalardan tanlab olingan iqtisodiy belgilarni birlashtirib, kerakli ekspressiya genotiplarini sintez qilish. Ma’lum bo‘lgan populatsiya va o‘rnatilgan naslchilik materialidan foydalangan holda, yangi zotlarni sintez qilish maqsadini genlarning kerakli kombinatsiyasi uchun mos seleksiya bosimini qo‘llash orqali osongina amalga oshirish mumkin.

Ba’zi belgilarda yaxshi va ba’zi belgilar uchun yomon bo‘lgan ikki zotning o‘zaro chatishishi F_2 avlodida cheksiz ko‘p sonli lokuslarda belgilarning ajralishiga olib keladi [15] va shu bilan seleksionerga naslchilikni tanlash imkoniyatini beradi. Gibridizatsiyada qo‘llaniladiga rasalar o‘rtasida aniq genotipik va fenotipik farqlar yuqori darajadagi fenotipik o‘zgaruvchanlikni keltirib chiqaradi, va seleksionerga poligenik tizimdagi turli belgilar uchun tanlovni kuchaytishisga imkon beradi [21,22]. Tizimli tanlash bu ota-ona irqlarining ba’zi foydali xususiyatlarini birlashtirishdir. Geterozisdan foydalanish muhim ro’l oynaydi [24].

Sanoat-tijoriy duragaylarini ishlab chiqarish uchun eng yaxshi ota-onani tanlash muhim vazufalardan biridir. Ota-onalarning birlashma qobilyatini fenotipik ko’rsatkichlar bilan to’liq baholab bo’lmaydi [23]. Tabiiy ipakdagi fibroin regenerativ dorilar, tish iplari va farmakologik mahsulotlar uchun ideal biomaterialdir [27]. Ushbu ipak yurak-qon tomir jarrohligi uchun jarrohlik tikuv sifatida ham ishlatiladi. (Holland *et al*., 2019; Sun *et al*., 2021) [25,26]. *Bombyx Mori* da xonakillashtirish va moslashish jarayonida katta genetik xilma-xillik rivojlangan.

Hozirgi vaqtda dunyo miqyosida turning 200 ga yaqin zotlari turli xil ipakchilik ilmiy va o’quv tashkilotlarida saqlanadi [28]. Ushbu genetik manba voltinizm-bir yildagi hayot sikllari soni, moultinizm-lichinkalar siklidagi tuklar soni yoki geografik kelib chiqishi - Xitoy, Yapon Yevropa va tropik asosida tasniflanadi [29]. Bu genetik xilma-xillik va yuqori mahsuldorlik potentsialining yangi zotlarini sintez qilish uchun qimmatli manba hisoblanadi.

Hosildorlik potensialini faqat kerakli genlarni konsentratsiyalash va sun’iy tanlash orasidagi o’zgarishlarni kamaytirish orqali oshirish mumkin [30].

Biroq intensiv sun’iy seleksiya populatsiya ichidagi bir xillikni oshiradi va keyinchalik retsessiv allellarning ko’proq ifodalanishi inbred depressiyasi yoki genetik xilma-xillik fraksiyasi deb ataladi [31]. Genetik xilma-xillikning fraksiyalanishi va genlarning yo’qolishining oldini olish uchun yangi genotiplar zotlarini o’ziga xos xususiyatlarga ega bo’lgan duragaylash orqali rivojlantiriladi. Bu nasl-nasabga qarshidir va kuchni samarali ravishda tiklaydi va zararli retsessiv allelar ta’sirini qaytaradi [32]. Tut ipak qurti zotlarini duragaylash XIX asrda Xitoy va Yaponiyada boshlangan. Ipak qurtini duragaylashning asosiy maqsadi eskirgan zotlarni almashtirish uchun mukammal zotlarni ishlab chiqishdir. Yangi zotlar kasalliklarga chidamli va oldingi zotlarga nisbatan yuqori mahsuldorlik potentsiyaliga va atrof-muhitga moslashish qobilyatiga ega [32,33]. Ko’plab duragaylar unumdorlik, tuxumdan chiqish qobilyati, lichinka rivojlanishi, populyatsiya tezligi va ipak hosildorlik xususiyatlari,

jumladan, pilla vazni, ipakchanlik foizi, ipak maxsuldorligi kabi ustun biologik xususiyatlar bilan sintez qilingan [34,35,36,37].

Sahan [33] Pokistonda ipakchilik yozgi sanoatdir va fermerlar an'anaviy ravishta bivoltinli ipak qurti zotlarini boqadilar. Bu zotlar irsiy xilma-xillikning bo'linishi tufayli mahsuldorligi va kasalliklarga chidamliligini yo'qotgan ipak qurti zotlari hisoblanib ipakchilikda hal qiluvchi rol o'ynaydi. (Zhao *et al*., 2007) [38].

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