O‘ZBEKISTON RESPUBLIKASI OLIY TA’LIM, FAN VA INNOVATSIYALAR VAZIRLIGI

MIRZO ULUG‘BEK NOMIDAGI O‘ZBEKISTON MILLIY UNIVERSITETINING JIZZAX FILIALI

RAQAMLI JAMIYATDA FAN VA TA’LIMNING INTEGRATSIYALALASHUVI: MATEMATIKA, IQTISOD, PEDAGOGIKA VA PSIXOLOGIYANING YANGI YONDASHUVLARI

mavzusidagi Respublika ilmiy-texnik anjuman materiallari to‘plami

(2026-yil 20-21-aprel)

JIZZAX-2026

Raqamli jamiyatda fan va ta’limning integratsiyalalashuvi: matematika, iqtisod, pedagogika va psixologiyaning yangi yondashuvlari. Respublika ilmiy-texnik anjuman materiallari to‘plami – Jizzax: O‘zMU Jizzax filiali Amaliy matematika kafedrasi, 2026-yil 20-21-aprel 505-bet.

Respublika miqyosidagi ilmiy-texnik anjuman materiallarida zamonaviy kompyuter ilmlari va muhandislik texnologiyalari sohasidagi innovatsion tadqiqotlar aks etgan.

Globallashuv sharoitida davlatimizni yanada barqaror va jadal sur’atlar bilan rivojlantirish bo‘yicha amalga oshirilayotgan islohotlar samarasini yaxshilash sohasidagi ilmiy-tadqiqot ishlariga alohida e’tibor qaratilgan. Zero iqtisodiyotning, ijtimoiy sohalarni qamrab olgan modernizatsiya jarayonlari, hayotning barcha sohalarini liberallashtirishni talab qilmoqda.

Ushbu ilmiy ma’ruza tezislari to‘plamida mamlakatimiz va xorijlik turli yo‘nalishlarda faoliyat olib borayotgan mutaxassislar, olimlar, professor-o‘qituvchilar, ilmiy tadqiqot institutlari va markazlarining ilmiy xodimlari, tadqiqotchilari, magistr va talabalarning ilmiy-tadqiqot ishlari natijalari mujassamlashgan.

Mazkur to‘plamga kiritilgan ma’ruza tezislarining mazmuni, undagi statistik ma’lumotlar va me’yoriy hujjatlarning to‘g‘riligi hamda tanqidiy fikr-mulohazalar, keltirilgan takliflarga mualliflarning o‘zlari mas’uldirlar.

Shu bilan birga, artishokning geografik tarqalishi, kimyoviy tarkibi va sanoat miqyosida qayta ishlanishi uning iqtisodiy va agrobiotexnologik ahamiyatini yanada oshiradi [7]. Shu sababli, ushbu o‘simlik nafaqat dorivor manba, balki yuqori qiymatga ega bo‘lgan biotexnologik resurs sifatida qaraladi.

Xulosa

Cynara scolymus L. o‘simligi tarkibida biologik faol moddalar, xususan polifenollar, flavonoidlar va inulin mavjudligi uning yuqori antioksidant va yallig‘lanishga qarshi xususiyatlarini ta’minlaydi. Tadqiqotlar natijalari ushbu o‘simlikning biotexnologik jihatdan istiqbolli xomashyo ekanligini ko‘rsatadi. Zamonaviy ajratib olish usullari va biopreparatlar qo‘llanilishi orqali bioaktiv moddalar miqdorini oshirish imkoniyati mavjud. Shu sababli artishokni funksional oziq-ovqat va farmatsevtik mahsulotlar ishlab chiqarishda keng qo‘llash maqsadga muvofiq hisoblanadi.

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BIRINCHI TARTIBLI CHIZIQLI DIFFERENSIAL TENGLAMALARGA KELTIRILADIGAN GEOMETRIK VA FIZIK MASALALARNI INTEGRALLASH

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Differensial tenglamalar matematikaning eng muhim va keng qo‘llaniladigan bo‘limlaridan biri bo‘lib, u tabiat hodisalarini, muhandislik jarayonlarini va ijtimoiy-iqtisodiy modellarni matematik tilda tasvirlashning asosiy vositasi hisoblanadi. Tabiatdagi ko‘pgina jarayonlar - jismning harakati, issiqlikning tarqalishi, elektr tokining o‘zgarishi, aholining o‘sishi - barchasi differensial tenglamalar orqali ifodalanadi.

Birinchi tartibli chiziqli differensial tenglamalar (BTCDT) ushbu keng sohaning eng ko‘p uchraydigan va amalda keng ishlatiladigan turi hisoblanadi. Ularning o‘rganilishi nafaqat nazariy jihatdan muhim, balki muhandislik, fizika, kimyo, biologiya va iqtisodiyot kabi fanlarda real muammolarni yechishda ham katta ahamiyat kasb etadi.

Ushbu maqolaning maqsadi birinchi tartibli chiziqli differensial tenglamalarga keltiriladigan geometrik va fizik masalalar sinfini tizimli ravishda o‘rganish, har bir masala turini differensial tenglama ko‘rinishida ifodalash algoritmini ishlab chiqish va aniq misollar yordamida yechish metodologiyasini ko‘rsatishdan iborat.

Birinchi tartibli chiziqli differensial tenglamaning umumiy ko‘rinishi: $y' + P(x)y = Q(x)$, bu yerda $P(x)$ va $Q(x)$-x argumentining uzluksiz funksiyalari. Agar $Q(x) = 0$ bo‘lsa, tenglama gomogen (bir jinsli), aks holda nogomogen (noto‘liq jinsli) deyiladi.

Geometrik masalalar -bu egri chiziqlar oilalarining xossalarini aniqlash, ularning urinmalari, normallari yoki boshqa geometrik obyektlar bilan bog‘liq shartlardan foydalanib, tegishli differensial tenglamani tuzish va yechish bilan bog‘liq masalalar sinfidir.

1-masala: Shunday egri chiziq topingki, uning ixtiyoriy $M(x, y)$ nuqtasidagi urinma kesmasi koordinata boshidan uch marta uzun bo‘lsin.

Yechish: $y = f(x)$ egri chizig‘i uchun urinma tenglamasi $Y - y = y'(X - x)$. Urinma Y o‘qi bilan kesishish nuqtasi $Y = y - x \cdot y'$. Shartga ko‘ra: $y - x \cdot y' = 3y \to y' = -\frac{2y}{x}$. Yechib: $y = \frac{C}{x^2}$ - giperbolalar oilasi.

2-masala: Ortogonal traektoriyalar. Ortogonal traektoriyalar - berilgan egri chiziqlar oilasini har bir kesishish nuqtasida to‘g‘ri burchak ostida kesuvchi egri chiziqlar oilasi. Masala: $y = Cx^2$ parabolalar oilasiga ortogonal traektoriyalarni topish. Yechish: $y' = \frac{2y}{x} \to y = Cx^2$ ortogonal traektoriyalar uchun $y' = -\frac{x}{2y} \to \frac{x^2}{2} + y^2 = C_1$ - ellipslar oilasi.

3-masala: Izogonal traektoriyalar. Izogonal traektoriyalar berilgan oilani α burchak ostida kesadi. To‘g‘ri chiziqlarni 45° burchakda kesuvchi izogonal traektoriyalar topiladi. Burchakli almashtirish $y = Cx$ orqali yechib: $r = k \cdot e^{\theta}$ - logarifmik spiral hosil bo‘ladi.

4-masala: Optik masalalar. O‘q bo‘ylab parallel kelgan barcha nurlarni F fokusga to‘plovchi ko‘zgu profilini topish masalasida geometrik shart (direktrisdan masofa = fokusdan masofa) asosida: $y^2 = 4px$ - parabola hosil bo‘ladi. Demak, yig‘uvchi ko‘zgu shakli paraboladir.

5-masala: Mexanikadagi masalalar. m massali jism v_0 tezlik bilan yuqoriga otilganda Nyutonning II qonuniga ko‘ra: $m \cdot \frac{dv}{dt} = -mg - kv$. Bu BTCDT:
$\frac{dv}{dt} + \frac{k}{m} \cdot v = -g$.

Yechish: $v(t) = \left(v_0 + \frac{mg}{k}\right) \cdot e^{-\frac{kt}{m}} - \frac{mg}{k}$, $t \to \infty$ da $v \to -\frac{mg}{k}$
(chegara tezlik - terminal tezlik).

6-masala: RL-zanjir. Kirxgof qonuniga ko‘ra: $L \cdot \frac{dI}{dt} + R \cdot I = E_0 \cdot \sin(\omega t)$.

Yechish: $I(t) = \frac{E_0}{R^2 + \omega^2 L^2} \cdot \left[R \cdot \sin(\omega t) - \omega L \cdot \cos(\omega t) + \omega L \cdot e^{-\frac{Rt}{L}}\right]$. Yechimning birinchi qismi - statsionar, ikkinchisi - o‘tkinchi had. O‘zgarmas tok (DC) zanjirida: $I(t) = \frac{E}{R} \cdot \left(1 - e^{-\frac{Rt}{L}}\right)$ tok eksponensial ravishda E/R chegaraviy qiymatga yaqinlashadi.

7-masala: Nyutonning sovish qonuni. $I(t) = \frac{E}{R} \cdot \left(1 - e^{-\frac{Rt}{L}}\right)$tenglamasini yechib:$T(t) = T_a + C \cdot e^{-kt}$.

Yechish: $T_0 = 90^{\circ}$Cli choy $T_a = 20^{\circ}$C haroratdagi xonada soviydi. 10 daqiqada $T_1 = 70^{\circ}$C bo‘lsa, $k \approx 0{,}0336$ topiladi va 30 daqiqada $T(30) \approx 45{,}5^{\circ}$C bo‘ladi.

8-masala: Aralashmalar masalasi. $V = 100$ litr sig‘imli idishda $c_0 = 0{,}5$ kg/l konsentratsiyali eritma mavjud. $c_{in} = 0{,}2$ kg/l eritma 3 l/min tezlikda kirib, 3 l/min tezlikda chiqadi $\frac{dy}{dt} + 0{,}03y = 0{,}6$.

Yechish: $y(t) = 20 + 30 \cdot e^{-0,03t}$ kg. $t \to \infty$da $y \to 20$ kg, ya'ni konsentratsiya kirayotgan eritmaning konsentratsiyasiga tenglashadi.

Har qanday amaliy masalani yechish uchun quyidagi to‘rt bosqichli algoritm tavsiya etiladi: 1-bosqich - Model tuzish: asosiy o‘zgaruvchilarni aniqlash; 2-bosqich - Tenglama hosil qilish: $y' + P(x)y = Q(x)$ standart ko‘rinimiga keltirish; 3-bosqich - Yechish: integrallovchi ko‘paytuvchi yoki Bernulli usuli orqali umumiy va xususiy yechimni topish; 4-bosqich - Talqin qilish: natijani fizik yoki geometrik ma'noda izohlash va tekshirish.

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ON SOME SPECIFIC FEATURES OF HIGH-FREQUENCY SOUND DISPERSION IN A SOLUTION WITH A PECULIAR POINT

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Aqueous solutions of methyl derivatives of pyridine with concentrations 0.06 to 0.08 mole fraction (MF) at the normal air pressure and temperature t0 ≈ 70°C have a minimum of thermodynamic stability [1] (a peculiar point in the temperature–concentration phase diagram) and thus are convenient for studying structural transformations in the vicinity of the peculiar point.

Earlier ultra- and hyperacoustic parameters of a solution belonging to this class (aqueous solution of 3-methylpyridine) were investigated in our laboratory [2-4]. Temperature dependences of the ultra- and hypersound velocities in the temperature range from 20 to 80 °C unambiguously pointed to existence of positive sound velocity dispersion in the vicinity of the singular point. The analysis of the experimental results for this solution obtained at the frequency about 2.6 GHz gives grounds to assume that negative velocity dispersion (i.e., a decrease in the velocity with increasing sound frequency) may also exist in the vicinity of the singular point in a narrow hypersound frequency range. To verify this assumption, it is necessary to investigate temperature dependences of the speed of sound in the aqueous solution of 4-methylpyridine (4MP) with the concentration 0.06 MF corresponding to the peculiar point.

In this paper, we discuss the results of the first study of the frequency dependence of the hypersound velocity dispersion in aqueous solutions of 4-methylpyridine (4MP) with concentration x=0.06 MF (the peculiar point). As compared with our previous investigations, the sound frequency range is appreciably wider, from 5.4 MHz to 6.1 GHz.

The ultrasound velocity for the frequency of 5.4 MHz was measured by the acoustic-optical method based on laser radiation diffraction by ultra- sound waves. The hypersound velocity in the frequency range from 2.6 to 6.1 GHz was determined from the frequency shift of the fine-structure component of the Rayleigh light scattering line (Brillouin component) for three scattering angles 45, 90 and 135°.