UDK 631.312.8

IKKI YARUSLI DISKLI PLUG YUQORI YARUS KORPUSINI PASTKI YARUS KORPUSIGA NISBATAN KO‘NDALANG YO‘NALISHGA SILJISH MASOFASINI ANIQLASH

To‘xtaqo‘ziyev Abdusalim
Qishloq xo‘jaligini mexanizatsiyalash ilmiy-tadqiqot instituti, t.f.d.,professor
Ishmuradov Shuxrat Ulug‘berdiyevich
Islom Karimov nomidagi Toshkent davlat texnika universiteti, PhD., v.v.b.professor
shuxrat7223@gmail.com
Beketov Timur Kazakbayevich
Islom Karimov nomidagi Toshkent davlat texnika universiteti, assistent
Abdurasulov Samandar O‘tkir o‘g‘li
Islom Karimov nomidagi Toshkent davlat texnika universiteti, talaba

Annotatsiya: *Ushbu maqolada keltirilgan ifodalar tahliliga ko‘ra, yuqori yarus korpusini pastki yarus korpusiga nisbatan ko‘ndalang yo‘nalishda siljish masofasi ularning parametrlariga, ishlov berish chuqurliklari, tuproq bo‘laklarining yuqorigi yarus korpusining ishchi sirtidan tushish balandliklari hamda plugning harakat tezligiga bog‘liqligi bo‘yicha olib borilgan nazariy tadqiqotlar natijalari keltirilgan.*

Tayanch so‘zlar*: yuqorigi yarus korpusining pastki yarus korpusiga nisbatan ko‘ndalang yo‘nalishda siljishi, o‘simlik qoldiqlari, begona o‘tlar, ularning urug‘lari chuqur va sifatli ko‘milishi, yuqorigi yarus korpusidan tushayotgan tuproq bo‘laklari, pastki korpus hosil qilgan egatning o‘rtasi, kelib tushishi, parametrlari, ishlov berish chuqurliklari, tuproq bo‘laklarining yuqorigi yarus korpusining ishchi sirtidan tushish balandliklari hamda plugning harakat tezligiga bog‘liqligi.*

Аннотация: *согласно анализу выражений, приведенных в данной статье, приведены результаты теоретических исследований по зависимости расстояния перемещения корпуса верхнего яруса в поперечном направлении от корпуса нижнего яруса от их параметров, глубины обработки, высоты падения частиц почвы с рабочей поверхности корпуса верхнего яруса, а также скорости движения плуга.*

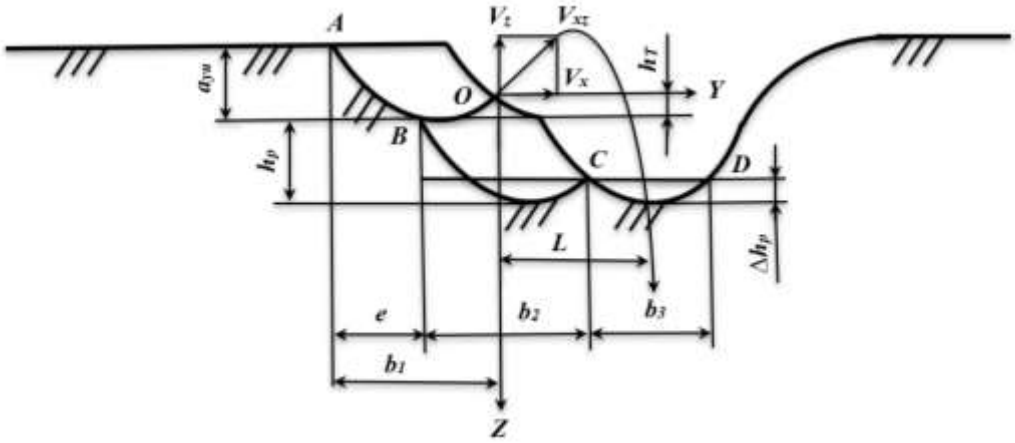
Ключевые слова: *перемещение корпуса верхнего яруса в поперечном направлении относительно корпуса нижнего яруса, глубокое и качественное заделение растительных остатков, сорняков, их семян, частицы почвы, падающие с корпуса верхнего яруса, середина борозды, образованной нижним корпусом, падение, параметры, глубина обработки, высота падения частиц почвы с рабочей поверхности корпуса верхнего яруса и зависимость от скорости движения плуга.*

Abstract: *Based on the analysis of the expressions presented in this article, the results of theoretical studies on the dependence of the transverse displacement of the upper-tier body relative to the lower-tier body are provided. This dependence is considered in relation to their parameters, tillage depth, the falling height of soil particles from the working surface of the upper-tier body, as well as the operating speed of the plow.*

Keywords: *Transverse displacement of the upper-tier body relative to the lower-tier body, deep and high-quality incorporation of plant residues, weeds and their seeds, soil particles falling from the upper-tier body, midpoint of the furrow formed by the lower-tier body, falling process, parameters, tillage depth, height of soil particle fall from the working surface of the upper-tier body, dependence on plow operating speed.*

Keyingi yillarda qishloq xo'jaligida energiya-resurstejamkor texnologiyalar va texnika vositalari keng joriy etilishi munosabati bilan yerlarga asosiy ishlov berish(shudgorlash)da diskli, ya'ni ish organi sferik disk ko'rinishida bo'lgan pluglarni qo'llash muhim ahamiyat kasb etmoqda. Chunki ular ag'dargichli pluglarga nisbatan tortishga kam qarshilik ko'rsatadi, ish unumi yuqori, o'simlik qoldiqlari va begona o'tlarga tiqilmasdan ishlaydi[1].

O'simlik qoldiqlari, begona o'tlar va ularning urug'lari chuqur va sifatli ko'milishi uchun yuqorigi yarus korpusidan tushayotgan tuproq bo'laklari pastki korpus hosil qilgan egatning o'rtasiga kelib tushishi kerak. Buning uchun 1-rasmda keltirilgan sxemaga muvofiq quyidagi shart bajarilishi lozim



1-rasm. Yuqori yarus korpusini pastki yarus korpusiga nisbatan ko'ndalang yo'nalishga siljishini aniqlashga doir sxema

$e = b_1 + L - b_2 - 0{,}5b_3$, (1)

bunda b_1 – 1-rasmdagi A va O nuqtalar orasidagi ko'ndalang masofa, m;

L – plugning yuqori korpusidan tushayotgan tuproq bo'lagining ko'ndalang yo'nalishda uloqtirilish masofasi, m;

b_2 – 1-rasmdagi B va C nuqtalar orasidagi ko'ndalang masofa, m;

b_3 – 1-rasmdagi C va D nuqtalar orasidagi ko'ndalang masofa, m.

(1) ifodadagi b_1, b_2 va b_3 ko'ndalang masofani quyidagi ifoda bo'yicha aniqlaymiz [2]

$$b_1 = \left[\sqrt{\frac{h_{yu}}{\cos\beta}\left(D - \frac{h_{yu}}{\cos\beta}\right)} + \sqrt{\frac{h_T}{\cos\beta}\left(D - \frac{h_T}{\cos\beta}\right)}\right]\sin\alpha; \qquad (2)$$

$$b_2 = \left[\sqrt{\frac{h_p}{\cos\beta}\left(D - \frac{h_p}{\cos\beta}\right)} + \sqrt{\frac{\Delta h_p}{\cos\beta}\left(D - \frac{\Delta h_p}{\cos\beta}\right)}\right]\sin\alpha; \qquad (3)$$

$$b_3 = 2\sqrt{\frac{\Delta h_p}{\cos\beta}\left(D - \frac{\Delta h_p}{\cos\beta}\right)}\sin\alpha, \qquad (4)$$

bunda h_T - plugning yuqori yarus korpusidan tushayotgan tuproq bo‘lagini undan hosil bo‘layotgan egat tubiga nisbatan joylashish balandligi, m;

Δh_p - plugning pastki korpuslaridan egat tubida hosil bo‘ladigan bo‘ylama notekislik (o‘rkach) larning balandligi, m.

L ni aniqlash uchun yuqori yarus korpusidan tushayotgan tuproq bo‘laklarining ZOY koordinatalar sistemasidagi harakatining differensial tenglamalarini tuzamiz.

Ular quyidagi ko‘rinishda bo‘ladi:

$$m\frac{d^2Y}{dt^2} = 0 \qquad (5)$$

va

$$\frac{m^2Z}{dt^2} = mg\ , \qquad (6)$$

bunda m - yuqorigi yarus korpusidan tushayotgan tuproq bo‘lagining massasi, kg;

g – erkin tushish tezlanishi, m/s^2;

t – vaqt, s.

(5) va (6) tenglamalarni boshlang‘ich shartlarni (t = 0 da $\frac{dY}{dt} = V_y$, $\frac{dZ}{dt} = V_z$, Y=0 va Z=0) hisobga olganda yechib, quyidagiga ega bo‘lamiz

$$L = V_y\frac{V_z + \sqrt{V_z^2 + 2g(h_T + h_p)}}{g}. \qquad (7)$$

Bu va (2) – (4) ifodalarni hisobga olganda (1) ifoda quyidagi ko‘rinishni oladi

$$e = \left[\sqrt{\frac{h_{yu}}{\cos\beta}\left(D - \frac{h_{yu}}{\cos\beta}\right)} + \sqrt{\frac{h_T}{\cos\beta}\left(D - \frac{h_T}{\cos\beta}\right)}\right]\sin\alpha + V_y\frac{V_z + \sqrt{V_z^2 + 2g\left(h_T + h_p\right)}}{g} -$$

$$-\left[\sqrt{\frac{h_p}{\cos\beta}\left(D - \frac{h_p}{\cos\beta}\right)} + \sqrt{\frac{\Delta h_p}{\cos\beta}\left(D - \frac{\Delta h_p}{\cos\beta}\right)}\right]\sin\alpha - \sqrt{\frac{\Delta h_p}{\cos\beta}\left(D - \frac{\Delta h_p}{\cos\beta}\right)}\sin\alpha. \quad (8)$$

Bu ifodadagi V_y va V_y ilgari bajarilgan tadqiqotlar bo‘yicha quyidagi ifodalar bo‘yicha aniqlanadi [3;4.]

$$V_y = \left\{ -\frac{1}{e^{2f\left[\arcsin\left(\frac{D}{2R}\right)-\varphi_0\right]}} \left[\frac{6fgR}{(1+4f^2)} \cos(\varphi_0+\beta)\cos\tau + 2gR\frac{(1-2f^2)}{(1+4f^2)} \times \right.\right.$$

$$\times \sin(\varphi_0+\beta)\cos\tau + 4V_u^2 \frac{R^2}{D^2}\cos^2\alpha\left(\frac{\sin 2\varphi_0}{f} - \sin^2\varphi_0\right)\Bigg] + \frac{6fgR}{(1+4f^2)}\cos\times$$

$$\times\left(\arcsin\frac{D}{2R}+\beta\right)\cos\tau + 2gR\frac{(1-2f^2)}{(1+4f^2)}\sin\left(\arcsin\frac{D}{2R}+\beta\right)\times$$

$$\times\cos\tau + 4V_u^2\frac{R^2}{D^2}\cos^2\alpha\left[\frac{D\sqrt{R^2-(0,5D)^2}}{fR^2} - \left(\frac{D}{2R}\right)^2\right]\Bigg\}^{\frac{1}{2}} \left(\frac{D}{2R}\cos\alpha + \right.$$

$$\left. + \frac{\sqrt{R^2-(0,5D)^2}}{R}\sin\tau\sin\alpha\right) + 0,5V_{\text{м}}\cos\tau\sin^2\alpha\cos\beta \qquad (9)$$

va

$$V_z = V_u\cos\alpha\sin\tau\cos\beta - \left\{ -\frac{1}{e^{2f\left[\arcsin\left(\frac{D}{2R}\right)-\varphi_0\right]}} \left[\frac{6fgR}{(1+4f^2)}\cos(\varphi_0+\beta)\cos\tau + \right.\right.$$

$$+2gR\frac{(1-2f^2)}{(1+4f^2)}\sin(\varphi_0+\beta)\cos\tau + 4V_u^2\frac{R^2}{D^2}\cos^2\alpha\left(\frac{\sin 2\varphi_0}{f} - \sin^2\varphi_0\right)\Bigg] +$$

$$+\frac{6fgR}{(1+4f^2)}\cos\left(\arcsin\frac{D}{2R}+\beta\right)\cos\tau + 2gR\frac{(1-2f^2)}{(1+4f^2)}\sin\left(\arcsin\frac{D}{2R}+\beta\right)\cos\tau +$$

$$+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\left[\frac{D\sqrt{R^2-(0,5D)^2}}{fR^2} - \left(\frac{D}{2R}\right)^2\right]\Bigg\}^{\frac{1}{2}} \frac{\sqrt{R^2-(0,5D)^2}}{R}\cos\tau, \qquad (10)$$

bunda f - tuproqni yuqori korpusning ishchi sirtiga ishqalanish koeffitsienti;

φ_0 - tuproq bo'lagini yuqori korpusning ishchi sirtidagi boshlang'ich holatini aniqlaydigan markaziy burchak, rad;

τ - yuqorigi korpusning tuproq bo'lagi undan tushayotgan paytdagi tik o'qqa nisbatan burilish burchagi, º;

V_i - plugning ilgarilanma harakatdagi tezligi, m/s..

$$\sin\tau = \frac{2\sqrt{Dh_T - h_T^2}}{D} \qquad (11)$$

va

$$\cos\tau = \frac{D-2h_T}{D}. \qquad (12)$$

(9) va (10) lar hamda (11) va (12) larni hisobga olganda (8) ifoda quyidagi ko'rinishni oladi

$$e = \left[\sqrt{\frac{h_{yu}}{\cos\beta}\left(D-\frac{h_{yu}}{\cos\beta}\right)}+\sqrt{\frac{h_T}{\cos\beta}\left(D-\frac{h_T}{\cos\beta}\right)}\right]\sin\alpha+\frac{1}{g}\left\{\left\{-\frac{1}{e^{2f\left[\arcsin\left(\frac{D}{2R}\right)-\varphi_0\right]}}\times\right.\right.$$

$$\times\left[\frac{6fgR}{(1+4f^2)}\frac{(D-2h_T)}{D}\cos(\varphi_0+\beta)+2gR\frac{(1-2f^2)}{(1+4f^2)}\frac{(D-2h_T)}{D}\sin(\varphi_0+\beta)+\right.$$

$$\left.+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\left(\frac{\sin 2\varphi_0}{f}-\sin^2\varphi_0\right)\right]+\frac{6fgR}{(1+4f^2)}\cos\left(\arcsin\frac{D}{2R}+\beta\right)\frac{D-2h_T}{D}+$$

$$+2gR\frac{(1-2f^2)}{(1+4f^2)}\sin\left(\arcsin\frac{D}{2R}+\beta\right)\frac{D-2h_T}{D}+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\times$$

$$\left.\times\left[\frac{D\sqrt{R^2-(0,5D)^2}}{fR^2}-\left(\frac{D}{2R}\right)^2\right]\right\}^{\frac{1}{2}}\left[\frac{D}{2R}\cos\alpha-\frac{2\sqrt{R^2-(0,5D)^2}}{R}\frac{\sqrt{Dh_T-h_T^2}}{D}\sin\alpha\right]+$$

$$+0,5V_u\frac{D-2h_T}{D}\sin 2\alpha\cos\beta\left.\right\}\left\{V_u\frac{2\sqrt{Dh_T-h_T^2}}{D}\cos\alpha\cos\beta-\left\{-\frac{1}{e^{2f\left[\arcsin\left(\frac{D}{2R}\right)-\varphi_0\right]}}\times\right.\right.$$

$$\times\left[\frac{6fgR(D-2h_T)}{(1+4f^2)D}\cos(\varphi_0+\beta)+2gR\frac{(1-2f^2)(D-2h_T)}{(1+4f^2)D}\times\sin(\varphi_0+\beta)\right.$$

$$\left.+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\left(\frac{\sin 2\varphi_0}{f}-\sin^2\varphi_0\right)\right]+\frac{6fgR(D-2h_T)}{(1+4f^2)D}\times\cos\left(\arcsin\frac{D}{2R}+\beta\right)+$$

$$+2gR\frac{(1-2f^2)(D-2h_T)}{(1+4f^2)D}\sin\left(\arcsin\frac{D}{2R}+\beta\right)+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\times$$

$$\left.\times\left[\frac{D\sqrt{R^2-(0,5D)^2}}{fR^2}-\left(\frac{D}{2R}\right)^2\right]\right\}^{\frac{1}{2}}\times\frac{\sqrt{R^2-0,5(D)^2}}{R}\frac{(D-2h_T)}{D}\left.\right\}+$$

$$+\left\{\left\{2V_u\frac{\sqrt{Dh_T-h_T^2}}{D}\cos\alpha\cos\beta-\left\{-\frac{1}{e^{2f\left[\arcsin\left(\frac{D}{2R}\right)-\varphi_0\right]}}\left[\frac{6fgR}{(1+4f^2)}\frac{(D-2h_T)}{D}\times\right.\right.\right.\right.$$

$$\times\cos(\varphi_0+\beta)+2gR\frac{(1-2f^2)}{(1+4f^2)}\frac{(D-2h_T)}{D}\sin(\varphi_0+\beta)+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\times$$

$$\left.\left.\left.\left.\times\left(\frac{\sin 2\varphi_0}{f}-\sin^2\varphi_0\right)\right]+\frac{6fgR}{(1+4f^2)}\frac{(D-2h_T)}{D}\cos\left(\arcsin\frac{D}{2R}+\beta\right)+\right.\right.\right.$$

$$+2gR\frac{(1-2f^2)}{(1+4f^2)}\frac{(D-2h_T)}{D}\sin\left(\arcsin\frac{D}{2R}+\beta\right)+4V_u^2\frac{R^2}{D^2}\cos^2\alpha\times$$

$$\times\left[\frac{D\sqrt{R^2-(0,5D)^2}}{fR^2}-\left(\frac{D}{2R}\right)^2\right]\Bigg\}^{\frac{1}{2}}\frac{\sqrt{R^2-(0,5D)^2}}{R}\frac{(D-2h_T)}{D}\Bigg\}^2+$$

$$+2(h_T+h_p)g\Big\}^{\frac{1}{2}}-\left\{\left[\sqrt{\frac{h_p}{\cos\beta}\left(D-\frac{h_p}{\cos\beta}\right)}+2\sqrt{\frac{\Delta h_p}{\cos\beta}\left(D-\frac{\Delta h_p}{\cos\beta}\right)}\right]\right\}\times$$

$$\times\sin\alpha-\sqrt{\frac{\Delta h_p}{\cos\beta}\left(D-\frac{\Delta h_p}{\cos\beta}\right)}\sin\alpha. \qquad (13)$$

Bu ifodadan ko‘rinib turibdiki, yuqori yarus korpusini pastki yarus korpusiga nisbatan ko‘ndalang yo‘nalishda siljish masofasi ularning parametrlariga, ishlov berish chuqurliklari, tuproq bo‘laklarining yuqorigi yarus korpusining ishchi sirtidan tushish balandliklari hamda plugning harakat tezligiga bog‘liq.

h_{yu}=0,15 m, β=20º, D=0,56 m, $h_T=\Delta h_p=0,5h_{yu}$=0,075m, α=40º, g=9,81m/s^2, f=0,5, R=0,66 m, φ_0=0, h_p=0,15 m qabul qilinib, (13) ifoda bo‘yicha o‘tkazilgan hisoblar 1,7-2,5 m/s harakat tezliklarida yuqorigi yarus korpusini pastki yarus korpusiga nisbatan ko‘ndalang yo‘nalishda siljish masofasi 17,8-20,7 sm oralig‘ida bo‘lishi lozim.

Demak, o‘tkazilgan tadqiqotlarimiz bo‘yicha 1,7-2,5 m/s harakat tezliklarida ikki yarusli diskli plug yuqorigi yarus korpusining pastki yarus korpusiga nisbatan ko‘ndalang yo‘nalishda siljish masofasi 17,8-20,7 sm oralig‘ida bo‘lishi lozim.

FOYDALANILGAN ADABIËTLAR:

1. To‘xtaqo‘ziev A., Ishmuradov Sh.U., Abzalova M. Diskli plug // O’zbekiston qishloq xo’ jaligi. – Toshkent, 2010. – №12. – B.29.

2. Нартов П.С. Дисковые почвообрабатывающие орудия. – Воронеж, 1972. –С. 182.

3. Ishmuradov Sh.U. Diskli plugning parametrlarini asoslash: Texn. fan. fals.dokt. ... diss. – Toshkent:, 2019. – 152 b.

4. Igamberdiyev A.O‘. Tuproqqa minimal ishlov beruvchi kombinatsiyalashgan agregat pushta olgichining parametrlarini asoslash: Tex. fan. (PhD) ... diss. avtoref. – Toshkent – 2021. – 39 b.