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MODELING OF MOISTURE DYNAMICS IN LAYERED STEPWISE SOFTENING OF SOILS PRONE TO SALINIZATION

Murodov R.A.

t.f.d., dotsent

Barnayeva M.A.

t.f.f.d. PhD

Jamolov F.N.

t.f.f.d. dotsent

Bukhara State Technical University

Qatlamli bosqichli chuqur yumshatish tuproq tuzilishi, havo almashinuvi va suv o‘tkazuvchanligiga sezilarli ta’sir ko‘rsatadi. Tajribalar yumshagan tuproq suvning an’anaviy usulgan nisbatan chuqurlikka chuqur kirib borishiga yordam berishini, o‘simliklarning ildiz tizimining rivojlanishi uchun qulay sharoit yaratishini xamda g‘o‘zaning ildiz qatlamida tuzlarning tiklanishini kechikishini ko’rsatadi. Jumladan, qatlamli bosqichli chuqur yumshatish usulini qo‘llashda ishchi organning ishlash chuqurligini va kengligini to‘g‘ri tanlash tuproqdagi kapillyarlarni buzishga, tuproqdan namlikning bug‘lanishini kamaytirishga va narialning mexanik ta’sirida plug tovoni (podoshva) buzilib g‘o‘za ildizlarini rivojlanishi uchun qulay sharoit yaratadi.

Tuproq zarralari turli o‘lchamlarda bo‘lishi va sug‘orish natijasida o‘z xajmini o‘zgarishi hamda oziq moddalar o‘simlik ildizlari orqali is’temol qilinishi tahlil qilinadi. BAT sharoitlari samaradorligini boshqarishning bir nechta ko‘rsatkichlari inobatga olinishi yoki integral indikatorlarning ma’lumotlari tuproq hamda o‘simlik o‘rtasida yuzaga keluvchi aniq jarayonlarni aks ettiruvchi regression hamda korreliatsion tahlil ma’lumotlari bilan baholanadi.
Qishloq xo‘jaligida foydalaniladigan tuproqlarning unumdorligini baxolashda yangi davr boshlandi ya’ni bonitetlash metodologiyasi. Tuproqni individual foydali parametrlarini o‘rganish natijasi orqali matematik modellashtirish asosida BAT tuproqlari tahlil qilindi.
Akad. A.F. Chudnovskiy tavsiyasiga asosan ildiz joylashgan faol qatlamda o‘simlik ildizi tuproq tarkibidagi tuzlarga va namlikka ta’sirini o‘rganish muhim bo‘lib, tenglama evopotranspiratsiyani hamda o‘simlik ildizlari ta’siri akademik Abutaliev F.B. tavsiyasiga muvofiq amalga oshiriladi.

$$\begin{aligned}
&\frac{d}{dz}\ D_1(W_1)\frac{dw_1}{dz}\ -\frac{dK_1(W_1)}{dz}-\frac{144E_T}{89(\delta+u_*)}\ 1-\frac{5z}{12(\delta+u_*)})-\frac{z^2}{3(\delta+u_*)^2}-\frac{z^3}{4(\delta+u_*)^3}\ =0,\\
&\frac{d}{dz}\ D_1^*(W_1^*)\frac{dW_1^*}{dz}\ -\frac{dK_1^*(W_1^*)}{dz}=0,\\
&\frac{d}{dz}\ D_2(W_2)\frac{dw_2}{dz}\ -\frac{dK_2(W_2)}{dz}=0,
\end{aligned}$$

$$\begin{aligned}
&0 \quad z \quad \delta+u_*\\
&\delta+u_* \quad z \quad z_1\\
&z_1 \quad z \quad L
\end{aligned} \qquad (1)$$

$$W_1(0)=W_{ПР}=const \qquad (2)$$

$$W_1^*(z_1)=W_2(z_1), \qquad (3)$$

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$$W_2(L) = W_{ПБ} = const \quad (4)$$

$$\left[K_1(W_1) - D_1(W_1)\frac{dW_1}{dz} + (W_1)\right]_{z=\delta+u_*} = \left[K_1^*(W_1^*) - D_1^*(W_1^*)\frac{dW_1^*}{dz} + (W_1^*)\right]_{z=\delta+u_*} \quad (5)$$

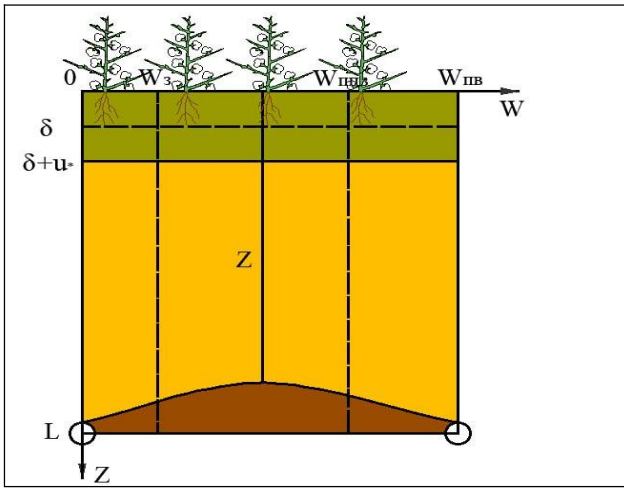
$$\left[K_1^*(W_1^*) - D_1^*(W_1^*)\frac{dW_1^*}{dz} + (W_1^*)\right]_{z=z_1} = \left[K_2(W_2) - D_2(W_2)\frac{dW_2}{dz} + (W_2)\right]_{z=z_1} \quad (6)$$

Bunda haydov va haydov osti qatlamlariga quyidagi belgilar qo‘yiladi ($\delta + u_*$) –ildiz qatlami chegarasi, m; z_1- haydov va haydovosti qatlamlari o‘rtasidagi chegara, m; μ - o‘simlik ildizini namlikni so‘rishining nisbiy qiymati, 1/sut; L – sizot suvlarning sathi, m; W_1, W_1^*, W_2 – mos ravishda ildiz, haydov va haydov osti qatlamlarida namlikning almashinuvi; namlik o‘tkazuvchnlik koeffitsientini quyidagi ko‘rinishida qabul qilamiz:

$$K_1(W_1) = A_1 e^{A_2 z}, \qquad K_1^*(W_1^*) = A_1^* e^{A_2^* z}, \qquad K_2(W_2) = B_1 e^{B_2 z} \quad (7)$$

Bunda quyidagi shart bajariladi:

$$\frac{144\,E_T}{89(\delta + u_*)} \int_0^{\delta+u_*} 1 - \frac{5z}{12(\delta+u_*)} - \frac{z^2}{3(\delta+u_*)^2} - \frac{z^3}{3(\delta+u_*)^3}\,dz = E_T \quad (8)$$



1 rasm. Namlik o‘zgarishining hisob sxemasi
W_{pv}- to‘la namlik sig‘imi; z- vertikal koordinata, yer yuzasidan pastga qarab yo‘naltirilgan.

Ushbu ko‘rilayotgan statsionar rejim uchun diffuzivlik koeffitsientining o‘rtacha qiymati qabul qilingan.

$$D_1(W_1) = D_1 = const\,, \quad D_1^*(W_1^*) = D_1^* = const\,, \quad (9)$$

$$D_2(W_2) = D_2 = const\,, \quad (10)$$

Qishloq xo‘jaligi ekinlari normal rivojlanishi uchun W_{PR}-tuproqdagi namlik o‘simliknining so‘lish - W_3 va tuproq to‘liq dala nam sig‘imi - W_{ppv} orasidagi bo‘lishi shart, ya’ni

$$W_3 < W_{ПР} < W_{ППВ} \quad (11)$$

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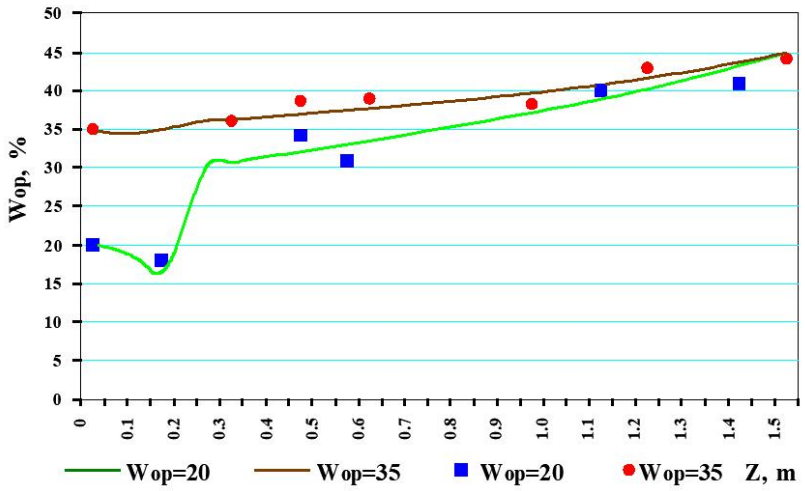
$$C_4 = W_{ПР} + \frac{A_1}{A_2 D_1}\left[e^{A_2(\delta+u_*)} - 1\right] + \frac{281E_T}{445D_1} - \frac{A_1^*}{A_2^* D_1^*} e^{A_2^*(\delta+u_*)} +$$

$$+(\delta+u_*)\ \frac{1}{D_1} - \frac{1}{D_1^*}\ \frac{1}{\frac{L}{D_2} + z_1\ \frac{1}{D_1^*} - \frac{1}{D_2}\ + (\delta+u_*)\ \frac{1}{D_1} - \frac{1}{D_1^*}} - \frac{D_1 E_T}{D_1^*}$$

$$W_{ПВ} - W_{ПР} - \frac{A_1}{A_2 D_1}\left[e^{A_2(\delta+u_*)} - 1\right] - \frac{A_1^*}{A_2^* D_1^*}\left[e^{A_2^* z_1} - e^{A_2^*(\delta+u_*)}\right] - \frac{B_1}{B_2 D_2}\left[e^{B_2 L} - e^{B_2 z_1}\right] -$$

$$-E_T\ \frac{281}{445D_1} + D_1\ \frac{L}{D_2} + z_1\ \frac{1}{D_1^*} - \frac{1}{D_2}\ - \frac{(\delta+u_*)}{D_1^*} \quad .$$

(12)



2-rasm. Tuproqdagi namlik miqdorini chuqurlikdagi bo‘yicha o‘zgarishi

2-rasmda ildiz qatlamida sug‘orishdan oldingi va sug‘orishdan so‘ng namlik o‘zgarishi aks ettirilgan. Bunda ildiz qatlamida (18 sm) namlik kamayishi, so‘ngra xaydalma qatlam (32 sm)da namlik ko‘payib, haydovosti qatlamda namlik sizot suvlar satxigacha kutarilib boradi. Mazkur grafikdan sug‘orish tamomlangach, namlik vertikal bo‘yicha yuqoriga, ya’ni xaydov osti qatlamidan xaydov qatlamiga va haydov qatlamidan ildiz qatlamiga qarab namlik xarakati mavjudligini aks ettirilgan.

Namlik almashinishi bo‘yicha tenglamalar sistemasida aniqlangan koeffitsientlar qiymati quyidagi jadval (1-jadval) da keltirilgan.

1-jadval

Namlikning almashishi bo‘yicha matematik modelning koeffitsientlarini aniqlash

Mexanik tarkibi	**Tenglamaning koeffitsientlari**				
	D_2	**D_1***	**D_1**	**V_2**	**V_1**

O‘rta qumoqli	0,02	0,00092	0,004	2,4	$4,56 \cdot 10^{-4}$
O‘rta qumoqli	$11,9 \cdot 10^{-3}$	$1,09 \cdot 10^{-3}$	$6,78 \cdot 10^{-3}$	2,51	$2,33 \cdot 10^{-4}$

Mexanik tarkibi	**Tenglamaning koeffitsientlari**			
	A_2*	**A_2**	**A_1***	**A_1**
O‘rta qumoqli	1,51	2,02	$4,49 \cdot 10^{-4}$	$6,52 \cdot 10^{-4}$
O‘rta qumoqli	2,47	2,35	$1,1 \cdot 10^{-4}$	$5,56 \cdot 10^{-4}$

Xulosa

1. G‘o‘zani sug‘orishda namlik va tuzni o‘tkazish agrotexnik tadqiqotlarning muhim yo‘nalishi bo‘lib, bu ekinni yetishtirishda suv va ozuqa moddalaridan samarali foydalanish bilan bog‘liq.

2. Ishlab chiqilgan namlik o‘tkazuvchanlik modellari "tuproq - g‘o‘za - suv" tizimidagi jarayonni o‘rganishga qaratilgan, ya’ni ishlab chiqilgan matematik modellar tuproq xossalari, ildizlarning o‘sishi va tarqalishi omillarini hisobga oladi, bu esa ko‘paytirish imkonini beradi. sug‘orish samaradorligi, optimal sug‘orish oraliqlari va sug‘orish normalarini hisoblash. qurg‘oqchilik yoki ortiqcha sug‘orish kabi stressli vaziyatlarning oldini oladi.

3. Massa o‘tkazish bo‘yicha tadqiqotlar azot, fosfor, kaliy va boshqa makro va mikroelementlarning dinamikasini hamda ularning g‘o‘zaning o‘sishi va hosildorligiga ta’sirini ko‘rib chiqish imkonini beradi.

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