Materials of the Conferences

BROWN ARID SOILS AND VEGETATION OF DRY STEPPE REGIONS IN DIFFERENT PASTURE REGIMES USAGE

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The calamitous state of dry steppe regions because of overgrazing like Aral region, Central Asia, North and Youth Turan, Black lands of Kalmykia and Tersko-Kumskaya lowland at the West Pre-Caspian depression ceased be news for the world scientific community long ago. In comparison with other natural zones under semi desert conditions there are simplified vegetation cover, weak accommodating possibilities to weather changes, weak reproduction, narrow diapason of environmental usage, less productivity and nourishment, higher vulnerability and variability degree under grazing. To restore the degraded arid pastures it is widely used the fodder grasses sowing, moderate grazing, forest belts cultivation, periodical regime of preservation of pasture territories.

The aim of this research is to give a generalized description of interdependency of vegetation and brown arid (light-chestnut) soils of the Tersko-Kumskaya lowland, which are the basic pastoral fund of region, in the regimes of preservation and grazing. Experiments were carried out since 1987 till 2006 year at three key zones in the scientific research framework of The Caspian Institute of Biological Resources. The first key zone is situated in the central part of Tersko-Kumskaya lowland: G1 – grazed ground 2-3 heads of sheep per hectare (h/ha), P1 – preservation regime during 3 years (0 h/ha). Soils are loamy sand solonchacovaty small massive. Vegetation represents stepped meadow composed by *Cynodon dactylon* with areas of *Camphorosma Lessingii, Atriplex tatarica, Suaeda microfilla, Ceratocarpus arenarius*. The second key zone is situated in the east part of the lowland. The regimes of grazing and preservation were studied in two repetitions: G2a – 3 h/ha, P2a – preservation regime during 4 years. Soils are light loamy solonchacovaty medium massive. G2b – 4 h/ha and P2b – 2 years. Soils are light loamy solonchacovy small massive. The soils of the second key zone are formed under cereals-wormwood plant groups from *Artemisia taurica, Art. austriaca, Poa bulbosa, Camphorosma Lessingii, Kochia prostrata.* The third key zone is situated in the north-east part of the lowland, grazing (G3) – 2-3 h/ha. Regime of preservation was spent under artificially introduced and irrigated during 12 years with artesian water forest massif composed with *Ulmus pumila, Elaeagnus angustifolia, Robinia pseudoacacia, Ziziphes jujuba* (P3). The soils are loamy sand solonchakovy small massive. Vegetation is represented with cereals-wormwood plant groups from *Artemisia taurica, Art. austriaca, Atriplex tatarica, Camphorosma Lessingii, Kochia prostrata, Alhagi pseudoalhagi, Suaeda microfilla, Poa bulbosa, Agropyron desertorum, Polygonum aviculare.* The samples for key zones were picked out in the following order: 1 – august 1987; 2 – July 1992; 3 – May 2006.

Introduced regimes of preservation promoted to main physical and chemical characteristics changes in soil profiles. Temperature in the upper soil lay lowered by 1.5-2^{o}C (P2a, P3); upper horizons became less dense: the volume weight in regime of preservation decreased – 1.35, 1.37 g/cm^3 (P3, P2a) in comparison with grazed pasture – 1.47, 1.5 g/cm^3 (G3, G2a), relative moisture decreased – 3.6 % (P3) against grazing regime – 5.5 % (G3), the soil surface deflation was slackened 2-4 times as much (P2b, P3). The regimes of preservation promote to soil profiles desalinization. Soil reserves in meter thicknesses of loamy sand soils are 28.37 t/ha (P1, P3) against 33, 72 t/ha (G1, G3). Due to leached soil meter thicknesses, the contrast of salinization degree of soil profiles decreased. On the soils with more heavy granulometric composition (light loam) only the upper 30 and 70-cm thicknesses was leached and in that case salts accumulated in lower soil horizons causing the increasing the contrast of degree salinization of soil profiles. Salt reserves in meter thicknesses of both regimes were practically the same: 113, 116 t/ha (G2a, P2a), 135, 143 t/ha (G2b, P2b).

The vegetation of preserved territories considerably changed: its ground, underground plant biomass (phytomass), projective cover. The ground phytomass productivity under forest massif (P3) increased up to 23 centners/ha (c/ha) with projective cover (PC) 90-100% because of cereals and forbs synusium with average plants height of grass layer 120 cm, while at the pasture (G3) the productivity was only 6 c/ha with PC 30-40 % (october 2004). In the forest belt lower grass layer vegetation cover diversity had grown: the areas of *Glycyrrhiza glabra, Phragmites communis, Agropyron desertorum, Polygonum aviculare, Convolvulus persicus* measuring 2-40 m^2 were registered there and they caused creating interfacial mosaic structure. Synusium changings of cereals and halophytic plants typical for semi desert vegetation were not observed in contrast to pasture. During 12 years there were formed forest landscape features: low layer consisted from cereal forbs, forest litter formed with deciduous and grass matter. The forest massif Fauna underwent changes too: lizards almost vanished, bugs were multiplied, crows nesting places appeared on trees. Thus we can speak about artificially introduced absolute original facies with its own characteristics. In the central part of region (first key zone) regime of preservation promoted to vegetation cover increasing from40-50% (G1) to 90-100 % (P1). Plant species structure was supplemented with *Phragmites communis*. While pressure became 4 sheep per ha (G2b) the following species such as *Stipa capillata, Koeleria cristata, Agropyron desertorum* disappeared, gradually abandoning herbage. Bad palatable *Artemisia Lerchiana, Poa bulbosa, Artemisia pauciflora, Atriplex tatarica, Polygonum aviculare* remained, and vegetation cover gradually degraded. Root matter underwent changes too. In regime P2a in the thickness 0-60 cm common root mass decreased up to 154 c/ha against G2a – 242 c/ha (august 1990); besides root mass quantity the structure of underground phytomass changed because of decreasing of rod roots (diameter >3 mm) from 13-29 % (G2a) to 5-8 % (P2a), in upper 0-20 cm layer roots >3 mm in P2a were absent. Thus, decreasing of rod roots quantity and participation became a reason of weakening of root suction, hence salt reserves decreased and relative moisture became lower in regime of preservation.

The analyze of brown arid soils and vegetation in different pasture regimes usage showed, that short-term regimes of preservation (in contrast to grazing regime) promoted to: desalinization of upper soil layers, changing of the contrast of salinization degree of soil profiles, weakening of soil deflation, lowering of temperature, decreasing of relative moisture because of root suction weakening, lessening of root mass quantity, vegetation cover augmentation, changing of plant species, changing of ground and underground phytomass structures. Generally, regimes of preservations on brown arid soils promoted to optimum state of soil processes and productivity restoration of pastures. Forest massif cultivation in addition to preserved regimes permited radically transform arid landscape to positive side up to creating of new landscape facies which is more autonomous to negative external influences.

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