AMERICAN JOURNAL OF MULTIDISCIPLINARY BULLETIN
ISSN: 2996-511X (online) | ResearchBib (IF) = 9.512 IMPACT FACTOR
Volume-3| Issue-8| 2025 Published: |30-09-2025|

UDC.631.352.022

METHODOLOGY FOR ASSESSING THE DEGREE OF STEM SPLITTING IN DESERT FORAGE PLANTS BASED ON THE QUALITY OF THE CUT

https://doi.org/10.5281/zenodo.17263422

Tolibaev A.E
Doctor of technical sciences, senior researcher, first deputy director general of the center for certification and testing of agricultural machinery and technology (CCTT)
Gorlova I.G
Candidate of technical sciences, associate professor at Tashkent State Agrarian University (TSAU)
Umarova N.S
Candidate of technical sciences, associate professor at Tashkent State Agrarian University (TashSAU)
Khaziev S.A
Doctor of philosophy in technical sciences, PhD
Research institute of agricultural mechanization (RIAM)

Abstract. One of the significant factors accelerating the process of vegetation extinction and reducing the quality requirements for the technological process of mowing desert fodder plants is stem splitting. The article proposes a method for assessing the degree of longitudinal splitting of the stems of desert fodder plants wormwood and yantak during mowing, as one of the requirements for the agrotechnical performance of rotary drums of forage harvesting machines. The method establishes a comparative determination of the degree of splitting of the stems of desert fodder plants wormwood and yantak by the length of the fibers of the stems of mowed plants torn by cutting knives. The results of a preliminary methodological experiment on the degree of splitting and the practicality of using the proposed method for determining the degree of splitting of desert fodder plant stems by measuring their length showed positive results. The proposed method is simple, accurate, and does not require special equipment.

Based on calculations of the length of stems split in desert fodder plants wormwood and yantak, it has been established that the degree of stem splitting in wormwood and yantak after mowing with a KPP-3 desert mower-rake is 17–20% for yantak and 23–25%. Requirements for the quality of the technological operation of splitting the stems of desert fodder plants have been formulated, stipulating that the degree of splitting of the stems of desert fodder plants should not exceed 50% of the total length of the plant.

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Keywords: Degree of cleavage, wormwood, yantak, accuracy of requirements, experiment, methodology.

Introduction. Mowing the stems of desert fodder plants such as wormwood and yantak for livestock feed with minimal breakage, tearing, and stretching with longitudinal cracks in the stems, leading to the formation of foci of various infectious diseases, impairs the subsequent regrowth of fodder plants. This leads to the destruction of vegetation and the formation of «pasture degradation» — one of the elements of healthy agriculture. An important condition for such agriculture is the least splitting of the stems of desert fodder plants such as wormwood and yantak. It is known that the degree of splitting of the stems of desert fodder plants wormwood and yantak when mowed with a desert mower-rake KPP-3 with serial cutting knives has a negative effect on the process of plant development and growth. Splitting of plant stems along the fibers and the presence of split ends provokes the appearance of infectious diseases that impair growth and ultimately lead to plant death [1, 2]. It has been proven that the degree of splitting of the stems of desert fodder plants wormwood and amber along the fibers negatively affects the subsequent regrowth of plants [3]. The experimental blades of the rotary drum of the KPP-3 desert mower-rake significantly reduce damage to the stem during mowing. It becomes possible to significantly reduce the requirements for mowed vegetation, simplify the design of the cutting blades of the rotary drum of the KPP-3 desert mower-rake, and change their shape, cutting angle, and sharpening angle.

Research objective. The studies examined the degree of splitting of the stems of desert forage plants wormwood and yantak when mowed with serial and experimental cutting blades of a rotary drum desert mower-rake KPP-3. The objective of the study is to develop a method for assessing the longitudinal splitting of the stems of desert fodder plants wormwood and yantak, with justification of agrotechnical requirements for minimum longitudinal splitting of the stems of desert fodder plants wormwood and yantak by the desert mower-rake KPP-3.

Materials and methods. The degree of decomposition of the stems of desert forage plants wormwood and yantak was determined on a laboratory bench (Fig. 1) in the laboratory «Machines for cultivating desert pastures and not-traditional crops» at the Scientific Research Institute of Agricultural Mechanization (NIIMSH) using a developed methodology [3].

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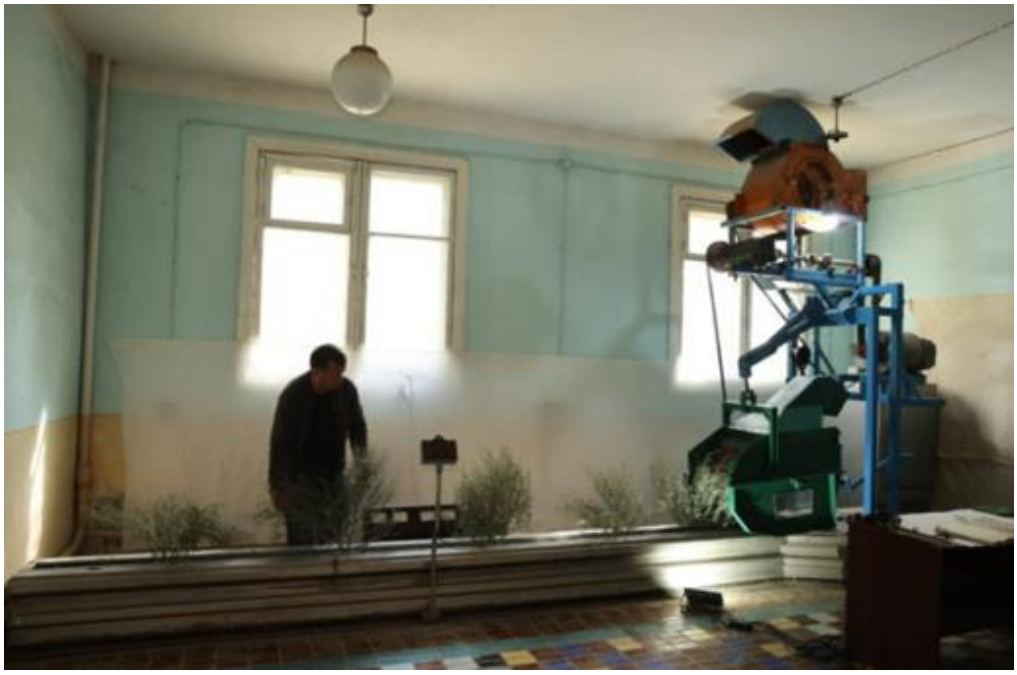

Fig. 1. Laboratory stand for determining the degree of stem splitting.

The method for assessing the degree of splitting of the stems of desert fodder plants wormwood and amber is based on a comparative determination of the degree of longitudinal splitting of plant stems by the length of split ends of a certain length. The algorithm of the method consists of sequential measurement in several sections. The quality of plant material grinding in tests of serial and experimental cutting blades of the rotary drum of the KPP-3 desert mower-rake is assessed at the optimal operating mode and at the optimal cutting length recommended by the operating manual. Initial fractions of cut stems were selected with a mass of 0.5 to 1 kg in an amount of at least three from the total crushed plant material coming out of the silo pipe. Each fraction was divided into two parts: one part was used to determine moisture content, and the other was used to analyze grinding quality. The second part of the fraction is mixed and three average fractions are prepared, each weighing 300 g. In each average fraction, all parts of the cut plants are measured and distributed among the fractions with a measurement error of ± 1 mm. The size of the fractions is adjusted taking into account the indicators of the experimental knives of the rotary drum of the KPP-3 desert mower-rake. Each fraction is weighed and its mass fraction is calculated with an error of ± 1 g. From each average selected fraction, split stems of forage plants are separated and measured with a ruler or caliper during laboratory bench tests or during the operation of the KPP-3 desert mower-rake on the reference areas. Cut stems are considered split if they are separated along the length of the plant by no more than 50% of the total length of the plant. The measurement error for the fraction is ± 1 mm, and the measurement results are calculated rounded to the first decimal place. The dimensional data obtained are recorded in the working

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logs of the primary documentation. The percentage of splitting of the stems of desert fodder plants wormwood and yantak is obtained from the calculation of data taking into account the average height of the plant cut. This method of determining the degree of splitting of the stems of desert fodder plants is accurate, simple, and does not require special equipment.

Results and discussion. The results of laboratory and bench studies of a methodological experiment on the practical application of the proposed method for determining the longitudinal splitting of the stems of desert fodder plants wormwood and amber grass (Fig. 2) are presented in Table 1.

а *б*

в *г*

Fig. 2. Quality of wormwood and yantak cut with experimental cutting blades (a) and (b) and standard blades (c) (d)

Table 1

Indicators of plant splitting with cutting knives

No.	Cutting knives	Stem feed rate into the ng drum, m/s	Degree of decomposition of plant stems, %
yantak			
1	Serial knife	1,66	41

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	(straight blades)	2,08	45
2	Experimental knife (concave es)	1,66	24
		2,08	29
3	Experimental knife (curved es)	1,66	17
		2,08	20
4	Experimental knife (convex es)	1,66	35
		2,08	40
wormwood			
1	Serial knife (straight blades)	1,66	47
		2,08	52
2	Experimental knife (concave es)	1,66	32
		2,08	35
3	Experimental knife (curved es)	1,66	23
		2,08	25
4	Experimental knife (convex es)	1,66	34
		2,08	39

Table 1 shows that the highest degree of splitting was observed in the stems of yantak (41–45%) and wormwood (47–52%) when using standard cutting blades. This is explained by the fact that at high rotor speeds, standard blades cut the plant stems, which contributes to poor-quality cutting, resulting in splitting of the stems, which does not meet agrotechnical requirements. Experimental cutting blades with concave blades split 24–29% of yantak stems when cutting, and 35–40% with convex blades, while wormwood stems split 32–35% with concave blades and 34–39% with convex blades.

Experimental knives with concave and convex blades cause less damage to the stem compared to standard knives with straight blades, but it is not possible to completely avoid splitting, as the stems slide along the edge of the slanted blade and accumulate at the tip of the blade (for concave knives). The stem is undercut because it moves across the slanted blade of the knife under the action of the high circumferential speed of the drum rotor (for a convex knife shape). Experimental cutting knives with slanted blades cut 17–20% of wormwood stems and wormwood stems by 23–25%. The cut of wormwood and yantak stems is as even and smooth as possible, since when cut, the stems slip off the knife at the moment of contact with the oblique edges of the knife blade, and this is what ensures a sliding cut. The proposed methodology, based on the results of the study, allows for a highly reliable assessment of the degree of stem splitting in desert forage plants when mowed with experimental blades of the KPP-3 desert mower-rake rotary drum. The methodology allows for control over the degree of plant splitting, which is the main requirement for the quality of the mowing process using the

KPP-3 desert mower-rake. According to the definition of the quality of the degree of splitting of the stems of desert fodder plants wormwood and yantak during their cutting, the optimal value of the longitudinal splitting of the stems of desert fodder plants wormwood and yantak decreases by 1.88%, while the completeness of harvesting the mowed forage mass from one hectare increases to 98.5% [3].

Conclusions.

1. Studies conducted using the method of assessing the degree of splitting of desert forage plant stems based on the quality of the cut show that cutting blades with oblique blades accounted for 17–20% of the cut stems of yantak and 23–25% of wormwood. The smoothest and most even cut of wormwood and yantak stems was achieved, as the stems slide off the cutting blade when they come into contact with the oblique blades, thus ensuring a sliding cut.

2. Based on the research conducted, the requirements for the quality of the technological process for mowing the stems of desert fodder plants wormwood and yantak were determined: - the degree of splitting was reduced by 1.88% while increasing the completeness of harvesting the mowed fodder mass from one hectare to 98.5%.

LIST OF REFERENCES:

1. Khaziev S.A. Justification of the shape and parameters of the cutting blade of a desert mower-rake: Doctor of Philosophy thesis in technical sciences (PhD). – Gulbakhhor: NIIMSH, 2025. – 171 p.

2. Khaziev S.A., Gorlova I.G. Quality of cutting desert fodder plants with a rotary cutting device of a mower-rake // Bulletin of Agrarian Science of Uzbekistan - Tashkent, 2023. - No. 8 [8/2]. - P. 186-190.

3. Tolibaev A.E., Yangiboev A.E., Khaziev S.A. Determination of wormwood stem splitting when mowing with experimental blades of the KPP-3.0 desert mower-rake rotor // Veterinariya sohasini riviojlantirishda ijtimoiy – gumanitar fanlarining o‘rni mavzusidagi respublika ilmiy – amaliy konferensiyasi ma’ruzalar to‘plami. – Toshkent, 2024. – pp. 271-275.