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Evaluation of interception in *Astragalus parrowianus* and its importance in Ecohydrological condition of Rangelands. case study: Gonbad rangeland located in Hamedan provience

[1]Nasrin Kolahchi, [2]Mohsen Mohseni Saravi, [3]Ali Tavili, [4]Mohammad Jafary

[1]PhD student in department of Range management, Science and Research Branch, Islamic Azad University,Tehran,Iran
[2,3,4]Dpt. of Reclamation of Arid and Mountainous Regions, Faculty of Natural Resources, university of Tehran.

Abstract: Vegetation cover is the first barrier through the raindrops and resulting to interception and infiltration loss. Interception as one of the main components of the ecohydrology equation has major role in water balance is rangeland watershed. However, few studies on interception of rangeland plants have been done. in this study was carried out the interception rate in *Astragalus parrowianus* through the rainfall portable simulator devices and relationship between plant structural factors (height, large diameter, small diameter, volume and surface canopy) and rangeland watershed physiographic factors (including altitude, slope percent, slope) were measured. Collected data analyzed with Minitab and Excel software and form of simple linear regression models and multivariate statistical (step by step approach and descending). Ensure that the results represent the first group volume size and level of 0.002 to 0.02 cubic centimeters and canopy cover 642 square meters, 4.421% of the total amount of rainfall abstraction and the second group with 0.02 to 0.087 cubic volume and crown cover 1640 square centimeters, interception rate is 1.85% the total precipitation. In the first group, interception rate at 1% significant correlations with large-diameter r= -0.729 and then at 5% level with the canopy cover showed r = -0.507. Interception rate in the second group at 1% significant correlations with canopy cover r = -0.929, diverse small diameter r= -0.874, large diameter r = -0.76 and plant volume size showed an r = -0.83. From the regression equations obtained in each group can measured the interception rate in Astragalus parrowianus without clipping and weighing,

Key words: interception rate-*Astragalus parrowianus*–Gonbad range land in Hamedan province–ecohydrology

INTRODUCTION

Study of ecohydrology condition in arid and semi arid regions of the world, is one of the newest methods for available water resource management. In this science, reviews all of effective ecology elements on water balance equation. In arid and semi arid regions, a strong relation between ecology and hydrology processes, can be seen. In these areas not only lack of precipitation, but irregular and unpredictable distribution of precipitation, is problematic. Ecohydrology particular attention to these areas of vegetation and its impact on groundwater and surface water balance is (Newman *et al* 2002). The most importance ecohydrology equation is the equation of balance or equilibrium of water.

$$Nz_r\, (ds(t)\,(dt)) = R(t) - 1(t) - Qe(s(t)) - L(s(t))$$

Left side of the equation expressing the total depth of water in plant roots week (average 30 cm from soil surface), the amount of space available in the soil *(n),* depth of plant roots or week active soil depth (z_r), changes in moisture saturated soil over time, $ds(t) / (dt)$

Right side of the equation include: rainfall $R(t)$, interception $I(t)$, evapotranspiration (E), runoff (Q), the soil moisture content $s(t)$ And the amount $(0 \leq s(t) \leq 1)$, the amount of water loss from the surface and subsurface layers (root *access)* $L(s(t))$

In this equation, factors affecting on areas ecohydrology conditions is proposed and clarifies framework and the main variables in the study ecohydrology

In rangelands and forests, vegetation through the process of interception, a significant impact on the hydrology cycle. Although loss of interception as a watershed is considered but in some coastal areas and warm moisturizing high altitude areas with low clouds and fog comes, interception can add moisture to the soil. canopy cover of trees absorb fog and dense interconnected and converted to soil humidity. In such cases, what is more foliage surface, the water input to soil is higher. Amount, duration, intensity, rainfall pattern, plant properties, plants and evaporation from the surface roughness at the plant level, all have effects on the amount interception (Brooks *et al* 1973).

Corresponding Author: Nasrin Kolahchi, PhD student in department of Range management, Science and Research Branch, Islamic Azad University, Tehran, Iran

1-1 Overview Of The Studies Done In The World:

The first studies in the United States showed that interception rate of leaf needle forest canopy was 10 to 35% of the total estimated annual precipitation (Zinke 1967) in the leaves needle forests of Pacific Northwest, there is high and a negative correlation with increasing diameter of raindrops and interception (Rothacher 1963). Height of the trees influence on a interception qua in low height trees of forest levels of interception rate is vary from 8 to 60% (David *et al* 2005). In the study conducted by Xiao *et al* (1998) in the Sacramento area in California, the average annual rate of interception the summer season with LAI was obtained. To estimate the amount of forest interception rate Horton equation (Horton 1919) and models such as model Gash analysis (based on linear regression model in low-density forest) is used (Gash *et al* 1979). Measured interception in rangelands and vegetative omnifarious forms requires skill and time in high during the growing season. the study conducted by researchers at the University of Regina, the amount of interception in broad-leaved plants and grasses was Variable length in growing seasons , qua after the eruption period in annual and perennial plants and bio mass loss , interception rate reduced so that the rate of interception in spring wheat during the vegetative period and before harvest was 11 to 19% of the total precipitation .

In the study conducted by Corbett (1968) in San Dimas rangelands of southern California interception rate in a Chaparral plant community than 12.8% and in Gross annual 7.9% of rainfall total was allocated to community and, if converted grass to Chaparral approximately 1.3 inches of total annual interception is stored. In the study conducted by Wood *et al* (1998) What Chihuhan desert region of China, the rate of interception of 10 dominant range species with vegetative form of grass, broadleaf and shrubs plants by the immersion method, found that there is a high correlation between plants structural factors and interception. In the study conducted by Wang *et al* (2005) in Shabato desert region of China, the amount of interception in a sagebrush plant communities (Artemisia *ordosica Krasch)* And karagana (*Caragana korshinskii* Kom) was investigated. This study measured the amount of interception during the coronal in individual rainfall and relationships of rainfall various factors with rates of interception. Results showed that in rainfall intensity of 2 mm on time, the amount of interception in the community with Artemisia cover 30% crown cover and average 0.8 m is less than Karagana community.

2 - Methods:

2-1 Introduction The study area:

The Gonbad basin is located in the southwest part and about 28 km from of Hamadan This watershed is Thiswatershed is located between the two northern latitudes of 48°41′5″and 48°43′17″and between the two eastern longitudes of 34°41′34″ and 34°42′16″. The mean annual precipitation of this region is 304.2 mm. The area of the Taleghan basin is about 300hectar. Minimum height of 2080 meters and a maximum basin elevation 2440 meters above sea level and the percentage of the basin slope is 5 to 42 percent. rainfall intensity during the year from 0.1 to 7.9 mm on hours varies. Irregular distribution of rainfall during the period from mid November to mid-April month. The average annual temperature of 5.89 degrees Celsius, relative humidity average annual rate of 58.7 percent and annual evapotranspiration is greater than rainfall. Using Domartan, dry climate and Coupons based on how climate is steppe. Soil texture varied from moderate to heavy land and construction of the transformation zone of Sanandaj - Sirjan is located and its elements back to the Second Age of Geology. Based on field observations, aerial photographs and satellite images, three physiographic unit's mountain, hill and dale in the plateau region is detectable. Figure 1 shows the location of the Gonbad basin.

2-2 Method:

The measurement of interception in range plants in has been rarely and mostly indirect methods and equations such as equation Horton (1919) is used. In the Ahead study measures directly the amount interception in *yellow milk-vetch* (Astragalus *parrowianus)*.This Plant has diversity species in forms shrubs and Herbaceous. Often had seen adventives and spine scent in mountainous regions and arid and semi arid lands, and seen over 804 diverse in different parts of Iran (ramak masumi 2007). Study on structural features and resulting tragacanth from Astragalus species have been done by different researchers and different regression equations are presented in this area (Assadian *et al* 2009) also this plant has an important role in water balance in the watershed ranges (Figure 2).

In field studies, sampling of vegetation from late September to mid October continued the interim period most of vegetative range plants have been completed and a short interval to onset of autumn rain. Therefore results so much affinity to the natural conditions. According to plant classification in more of 90% area, milk-vetch with other plant has been seen (Table 1). After combining layers of slope, slope, elevation and vegetation types, in the software ARCGIS, the working class were identified for sampling. Plot size according to the size and distribution of plant species and number of plots according to vegetation and physiographic changes in each class were determined. On this basis, used from 54 plots. in Each plot percent of canopy cover, plant height, large diameter, small diameter, percent cover of each plant and topographic factors including altitude, percent of slope and aspect with Garmin model GPS Device were recorded.

2-2-1 Implementation Process Of Precipitation With Rainfall Simulator:

Portable rainfall simulator device is capable to produce precipitation with 5 mm on hour's intensity, through 36 the nozzle with a diameter of 0.5 mm from 1.04 m height from ground level (Figure 7). During rainfall, raindrops form was distributed uniformly in the entire plot and all plants were equally resaving the rain (Figure 3 and 4). Immediately after rainfall, aerial biomass of plants cut and were placed separately in thick plastic bags. Samples collected from each plot after weighing the wet state, were in the open air and weighting in several stages until weight was constant (Figure 5 and 6). Finally, the difference between wet and dry weight divided to canopy cover area is interception rate of plants in gram and percentage of total precipitation. Based on volume size, the plant samples collected in the two classes. First class with a volume range of 0.002 to 0.02 cubic meters and second grade, with a volume range of 0.02 to 0.087 cubic meters.

Primary data collected from each plot rainfall simulator consists of diverse plant physiology parameters set in table 2. Columns 1 to 8 are physiology parameters; interception level is columns 9 and 10 and columns 11 to 13are environmental characteristics in the first group. The available data analysis with Minitab software (simple linear regression models and multivariate statistical, step by step approach and descending) and their relationships were correlated in Table 3. simple linear regression and multivariate models based on the highest correlation coefficients were obtained, and therefore the basis of charts 1 to 3 for the highest correlation coefficients in excel software in the first group were drawn.

In Table 4 Initial data collected from each plot rainfall simulator consists of diverse plant physiology parameters (columns 1 to 8) environmental characteristics (columns 11 to 13) and interception level (columns 9 and 10) in a volume group are provided. Correlation tables of data and graphs 4 to 8 are presented.

So the following equations can offered to predict the amount of interception in *Astragalus parrowianus*:

Univariate and multivariate equations to estimate the rate of interception in which the diverse range of 0.002 to 0.02 cubic volumes:

$y = -0.0036x + 0.2278 \qquad r = -0.729$ Equation 1

In Equation 1, Independent variable is plant large diagonal (cm) and the dependent variable is the amount of interception.

$y = -7E\text{-}05x + 0.1595 \qquad r = -0.507$ Equation 2

In Equation 2, Independent variable is crown cover cm square and the dependent variable is the amount of interception

$y = 0.0157 - 0.0059X_1 - 0.01x_2 + 0.00024X_3$ Equation 3

In Equation 3, the dependent variable and the interception level and dependent variables are as follows : Large diagonal X_1, crown cover X_2, small diagonal X_3

Univariate and multivariate equations to estimate the rate of interception in which the diverse range of 0.02 to 0.087 cubic volume:

$y = -9E\text{-}07x + 0.0887 \qquad r = -0.83$ Equation 4

In Equation 4, independent variable is plant volume in terms of cubic centimeters and the dependent variable is the amount of interception

$y = 0.0011x - 0.0271 \qquad r = 0.816$ Equation 5

In equation 5, Independent variable is difference dry and wet weight and the dependent variable is the amount of interception

$y = -5E\text{-}05x + 0.1222 \qquad r = -0.9$ Equation 6

In equation 6, independent variable is crown cover in terms of square meters and the dependent variable is the amount of interception

$y = -0.0026x + 0.1413 \qquad r = -0.874$ Equation 7

In equation 7, independent variable is small diagonal (cm) and the dependent variable is the amount of interception

$y = -0.0032x + 0.1913 \qquad r = -0.76$ Equation 8

In equation 8, Independent variable in the equation is large diagonal (cm) and the dependent variable is the amount of interception

$y = -0.02 + 0.00091X_1$ Equation 9

In equation 9, Independent variable is plant height and dependent variable is the amount of interception

Table 1: plant types in study area

Vegetation types	Area of vegetation types	Vegetation types	Area of vegetation types
Astragalus-Stipa-Eryngium	20.24 ha	Astragalus-Acantholimon-Stipa	42.57 ha
Astragalus-Artemisia-Acantholimon	8.47 ha	Astragalus-Acroptilon-Acanthophyllum	45.5 ha
Astragalus-Acanthophyllum-Verbascum	13.52 ha	Acroptilon-Acanthophyllum-Gundelia	15.37 ha
Astragalus-Acantholimon-Artemisia	22.16 ha	Astragalus-Stipa-Acroptilon	34.74 ha
Juncus-Eryngium	4.86 ha	Astragalus-Eryngium-Stipa	15 ha
Astragalus-Acantholimon-Acanthophyllum	29.9 ha	Juncus-Eryngium	8 ha
Astragalus-Acanthophyllum-Acroptilon	40.44 ha		

Table 2: topographic data, plant physiology and interception in *Astragalus parrowianus* (first group)

Row	1	2	3	4	5	6	7	8	9	10	11	12	13
	large diagonal (cm)	small diagonal (cm)	Height (Cm)	v olume (cm $^{3)}$	Wet (Gr)	Dry (Gr)	wet-dry (Gr)	Area Cm2)	Interception (Cm)	Interception (%)	Z (M)	Slop (%)	aspect
1	15	11	13	2288	244	200	44	164	0.198	7.388	2190	20.14	9.47
2	31	15	14	6510	275.2	208.7	63	465	0.135	5.055	2256	9.78	158.60
3	38	16	11	6688	159.8	109	50.8	608	0.084	3.118	2190	20.14	9.47
4	39	17	11	7293	46.89	300	46.89	663	0.071	2.639	2218	21.51	313.62
5	23	21	17	8211	138	89	49	483	0.101	3.785	2244	22.16	125.20
6	32	21	13	8736	154.8	47.8	90	672	0.134	4.997	2306	42.23	346.77
7	35	16	17	9520	201.6	139.1	62.5	560	0.112	4.164	2224	31.01	53.89
8	20	18	18	6480	168.8	68	68.8	360	0.191	7.131	2376	13.78	67.10
9	31	24	13	9672	295	200	95	744	0.128	4.764	2303	14.82	120.16
10	33	9	8	2376	322	300	26	297	0.088	3.266	2292	29.32	20.93
11	21	18	15	5670	185	134	51	378	0.135	5.034	2237	25.86	15.78
12	25	15	19	7125	35.76	100	35.76	375	0.095	3.558	2220	23.51	314.62
13	27	25	20	13500	130.4	16:20	68	675	0.101	3.759	2202	16.67	320.90
14	42	25	14	14700	305.6	276.6	74	1050	0.070	2.630	2301	29.43	92.86
15	35	34	13	15470	347.5	194.7	110	1190	0.092	3.449	2214	47.72	148.60
16	39	20	20	15430	223.9	120.4	100	780	0.128	4.784	2226	17.24	98.83
17	34	27	20	18360	327.2	188.9	112	918	0.122	4.552	2204	14.87	322.84
18	39	27	14	14742	269	200	69	1053	0.066	2.445	2229	17.51	313.62
19	28	27	25	17667	120	89.1	114	756	0.151	5.627	2263	14.70	76.49

Table 3: The correlation volume, small diameter, large diameter and height of *Astragalus parrowianus* (plant physiological factors) and altitude, slope, slope (topography factor) with the rate of interception in the first group

Component	Slope	Slope	Altitude	interception cm	interception %	Crown cover cm^2	Difference in dry weight gr	volume Cm^3	Plant height cm	Small diameter cm
Large diagonal	0.228ns	0.198ns	-0.108ns	-0.725 **	-0.724 **	0.707 **	0.263ns	0.456 *	-0.243ns	0.309ns
small diagonal	0.363ns	0.178ns	-0.032ns	-0.234ns	-0.233ns	0.878 **	0.804 **	0.861 **	0.373ns	
Plant height	0.163ns	-0.379 *	-0.062ns	0.272ns	0.271ns	0.116ns	0.500 **	0.610 **		
Plant Size	0.345ns	-0.031ns	-0.130ns	-0.232ns	-0.231ns	0.840 **	0.833 **			
Difference in dry weight	0.181ns	0.047ns	0.083ns	0.133ns	0.134ns	0.706 **				
Crown cover	0.365ns	0.251ns	-0.098ns	-0.485 *	-0.484 *					
interception cm	-0.345ns	-0.255ns	0.140ns	1.000 **						
interception %	-0.346ns	-0.255ns	0.142ns							
Altitude	-0.157ns	0.006ns								
Slope	0.023ns									

Ns at 5 percent is not significant   Significant at 1 percent**   Significant at 5 percent *

Table 4: Topographical data, plant physiology and interception in *Astragalus parrowianus* (second Group)

	1	2	3	4	5	6	7	8	9	10	11	12	13
	large diagonal (Cm)	small diagonal (Cm)	Height (Cm)	Volume (Cm $^{3)}$	Wet (Gr)	Dry (Gr)	wet-dry (Gr)	Area (Cm2)	Interception (Cm)	Interception %	Z (M)	Slop (%)	aspect
1	40	20	25	20500	294	200	94	800	0.089	3.321	2206	19.511	313.62
2	34	25	28	23800	168	100	68	850	0.080	2.985	2235	22.511	312.62
3	40	32	20	25600	281.4	200	81.36	1280	0.064	2.372	2255	23.511	313.62
4	36	30	27	29160	192	100	92	1080	0.085	3.179	2277	22.882	70.451
5	54	29	20	31320	365	300	65	1566	0.042	1.549	2336	19.903	140.84
6	46	36	22	36432	287	200	87	1656	0.053	1.960	2232	34.872	58.133
7	45	38	21	35910	363.9	67.5	95	1710	0.056	2.073	2304	54.579	350.26
8	45	40	20	36000	365	300	65	1800	0.036	1.347	2268	35.088	39.346
9	40	39	24	37440	175	100	75	1560	0.048	1.794	2259	27.234	206.61
10	49	44	21	45276	276.8	200	76.8	2156	0.036	1.329	2196	24.3	46.8
11	52	38	22	43472	159.8	100	59.8	1976	0.030	1.129	2215	21.511	313.62
12	42	35	40	58800	252	200	52	1470	0.035	1.320	2219	25.511	313.62
13	49	48	26	61152	176.3	29.4	55	2352	0.023	0.873	2191	13.217	184.65
14	47	46	34	73508	145	100	45	2162	0.021	0.777	2250	16.511	310.62
15	47	43	38	76798	357	300	57	2021	0.028	1.052	2265	23.518	314.62
16	48	45	40	86400	342.1	300	42.1	2160	0.019	0.727	2254	19.52	313.62
17	42	30	16	20160	293	200	93	1260	0.074	2.754	2233	16.761	315.62

Table 5: The correlation volume, small diameter, large diameter and height of *Astragalus parrowianus* (plant physiological factors) and altitude, slope, slope (topography factor) with the rate of interception In the second group

Component	Slope	Slope %	Altitude m	interception %	interception cm	Crown cover Cm^2	ifference in dry weight gr	Plant Size Cm^3	Plant height cm	Qatar Small cm
Large diagonal	-0.135ns	-0.074ns	0.076ns	-0.689 **	-0.685 **	0.763 **	-0.432 *	0.453 *	-0.034ns	0.534 *
small diagonal	-0.130ns	0.023ns	-0.132ns	-0.888 **	-0.888 **	0.951 **	-0.598 **	0.790 **	0.320ns	
Plant height	0.358ns	-0.234ns	-0.097ns	-0.368ns	-0.374ns	0.241ns	-0.681 **	0.793 **		
Plant Size	0.190ns	-0.202ns	-0.099ns	-0.791 **	-0.794 **	0.771 **	-0.816 **			
Difference in dry weight	-0.177ns	0.407 *	0.091ns	0.791 **	0.794 **	-0.620 **				
Crown cover	-0.137ns	-0.035ns	-0.112ns	-0.914 **	-0.913 **					
interception cm	0.067ns	0.053ns	-0.022ns	1.000 **						
interception %	0.069ns	0.049ns	-0.025ns							
Altitude	-0.047ns	0.400 *								
Slope	-0.094ns									

Ns at 5 percent is not significant Significant at 1 percent ** Significant at 5 percent *

Table 6: Average of plant physiographic characteristics in plots of rainfall simulator

Group Number	canopy cover%	Litter %	Stones and pebbles %	Soil %	interception Percent	LAI	Large diagonal cm	small diagonal cm	height cm	Crown cover	wet weight	Dry weight
1	90.267	1.933	4.733	3.067	4.421	0.516	30.947	20.316	15.526	642	229	56
2	94	1.444	2.555	2	1.85	0.477	44.529	36.353	26.118	1640	264	206

Table 7: best simple linear regression models in measuring interception in *Astragalus parrowianus* (Group I and Group II)

number	equation	R^2	r	P-value	y	x	group	volume range
1	y =-7E-05x + 0.1595	0.2571	-0.507 *	0.035	Interception	Area (cm2)	1	0.002-0.02 m^3
2	y =-0.0036x + 0.2278	0.532	-0.729 **	0.000	Interception	large diagonal	1	0.002-0.02 m^3
3	y =-9E-07x + 0.0887	0.6892	-0.83 **	0.000	Interception	volume	2	0.02-0.087 m^3
4	y = 0.0011x - 0.0271	0.6674	0.816 **	0.000	Interception	wet-dry weight	2	0.02-0.087 m^3
5	y =-5E-05x + 0.1222	0.8633	-0.929 **	0.000	Interception	Area (cm2)	2	0.02-0.087 m^3
6	y =-0.0032x + 0.1913	0.5777	-0.76 **	0.002	interception	large diagonal	2	0.02-0.087 m^3
7	y =-0.0026x + 0.1413	0.7654	-0.874 **	0.000	interception	small diagonal (cm)	2	0.02-0.087 m^3

* * Significant at 0.05 level * significant at 0.01 level

Conclusion:

For modeling the range lands water balance, should be quantify all components of water cycle. One of these components is interception (Wood *et al* 1998). 85-95% annual rainfall in arid and semi arid regions of the world, evaporated or spent in plants metabolic activity and only 5- 15% of precipitation will remain to feed stream flow or groundwater created. Usually in dry and semi-arid rangeland areas with lower density of canopy cover, compared to temperate forests and wet area, rate interception is lower. However, in such areas, even small amounts of water loss can be important (Brooks *et al* 1979). Based on regression models obtained in this study, the rate interception in Astragalus *parrowianus* can be measurable so that if the height of 2.87 cm of rainfall have in the region, *Astragalus parrowianus* with volume 0.002 to 0.02 cubic meters and average crown cover 0.0642 m, 4.422% of the total precipitation can be absorbed and *Astragalus parrowianus* with volume

0.02 to 0.087 cubic meters and average crown cover 0.1640, 1.85% of total precipitation absorb. On the other hand LAI in first group is 0.516 and in second group is 0.477 (Table 6). The results indicate that structural factors such as plant diagonal, plant canopy cover and plant size have direct impact and areas physiographic factors have indirect impact on *Astragalus parrowianus* interception. So that slope and different heights showed no significant effect on the interception rate (Tables 2 to 5) but physiographic factors effect on species composition and percentage of vegetation. As in the southern slopes, vegetation cover and vegetation density is less than the North directions. Apparent structure of plant, irregular spaces, and low leaf area index are factors that lead to decrease interception with increasing size and volume of *Astragalus parrowianus*. So that plant structural factors have height and inverse correlation with interception (Charts 1 and 2 in group I) and (Charts 4 to 7 in the second group). Leaf area index also decreased with increasing volume and diversity lead to water conservation to reduce transpiration in plants. Study conducted by Xiao *et al* (1998) in Sacramento, California represents the inverse relationship between canopy cover and leaf area index with interception rate. So that the amount of interception in the summer of needle leaf trees with large leaf area index equal to 5.1 was %36 and in medium-sized needle-leaf trees with LAI equal to 3.7 was 18.1%. Wang *et al* (2005) in Shabotu desert region of China, showed that the linear model and positively related to interception and the amount of crown cover in sagebrush plant community and Karagana community. As in the community with sagebrush cover 30% and canopy cover 0.8 m^2 in the growing season, averaging 5.9% and in the community with Karagana cover 46% crown cover and 3.8 m^2, was the average 11.7%. However, this study compared the two plants in a different society and comparisons with related deals have been done within the group. Based on graph 3 is seen high positive correlation between dry and wet weight (r =84%) and between fresh weight and interception (r=36%) in the first group. In the study conducted by Wood *et al* (1998) In Chihuhan area in China also in hardwood plant (forbs and shrubs) existing highly correlated between dry and wet weight with the amount interception. Biomass plants determine the plant weight and have direct relationship with interception so with increased plant weight increases the amount of interception. the study conducted by researchers at the University of Regina on grasses and hardwood also been noted so that the amount of interception with reduce aerial biomass in annual and perennial plants with harvesting and grazing by livestock has declined. So in the individual events based on off-season precipitation, the impact of structural parameters of plant and leaf area index in interception rate is significant and with reduces the aerial biomass is lower.

2-1 Suggestions:

1 - With range lands closed located in watershed upstream, the possibility of increasing the volume to be given a *Astragalus parrowianus*, same factors lead to increased effective precipitation and reduced interception.

2 - In the range of erosion-sensitive sheet, slide, creep and flow solifloction, planting and development of plants with high interception levels, to increase the resistance range is effective. According to the study, can be used of other species *Astragalus* with size and crown cover smaller and larger leaf area index.

To increase rangeland watershed discharge, conversion of vegetation species with deep roots to species with the root surface, conversion of vegetation species with high interception capacities to less capacities and conversion of vegetation with high Annual evapotranspiration to less capacity is suggested (Brooks *et al* 19)

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REFERENCES

Assadian, gh.kolahchi, na.sadeghi manesh, mo. 2009, investigation of effect and type of construct in different times on amount of gum tracaganth in yellow milk-vetch (Astragalus parrowianus), ajouhesh & Sazandegi in natural resources, 21: 170-175.

Brooks, N.kenneth.Efolliott, F.peter.Gragersen, M. hans. DeBano, F. leonard, 1973. Hydrology a and the management of watershed

Corbett, Edward, S., Crouse, P. Robert, 1968. Rainfall interception by annual grass and chaparral losses compared. Res. Paper PSW-RP-48. Berkeley, CA: Pacific Southwest Forest & Range Experiment Station, Forest Service, U.S. Department of Agriculture; p: 12.

David, J.S., F. Valente and J.H.C. Gash, 2005. Evaporation of intercepted rainfall, Ch 43, Encyclopedia of Hydrological Sciences, (Ed: MG Anderson), John Wiley, Chichester: pp: 627-634.

Gash, J.H.C., 1979. An analytical model of rainfall interception by forests. Quarterly Journal of the Royal Meteorological Society, 105: 43-55.

Horton, R.E., 1919. Rainfall interception. Monthly Weather Rev. U7:603-623.

http://uregina.com

Newman Brent, D., Wilcox, Bradford P., Steve Archer, David D. Breshears, Clifford N. Dahm, Christopher J. Duffy, Nathan G. McDowell, Fred M. Philips, Bridget R. Scanlon, Enrique R. Vivoni, 2002. The ecohydrology of Arid and semiarid Environments:A scientific vision.

Ramak masumi.a, 2007. Iran Astragalus .vol5, published by research institude of range and forest

Rothacher, J., 1963. *Net precipitation under a Douglas- fir forest. For. Sci*., 9: 423-429.

Xiao, Qingfu. McPherson, Gregory. Simpson, James R. Ustin, Susan L. 1998 .RAINFALL INTERCEPTION BY SACRAMENTO'S URBAN FORES. Journal of Arboriculture 24(4): July 1998 235

Wang, Xin-Ping. Xin-Rong Li; Jing-Guang Zhang; Zhi-Shan Zhang; Ronny Berndtsson, 2005. Measurement of rainfall interception by xerophytic shrubs in re-vegetated sand dunes / Mesure de l'interception de la pluie par des arbustes xerophiles sur des dunes de sable replantees Hydrological Sciences Journal, 50(5): 1-910.

Wood, M.K., T.L. Jones, M.T. Vera-Cruz, 1998, Rainfall interception by selected plants in the Chihuahuan Deser. Journal of Range management, 51: 91-96

Zinke, P.J., 1967. Forest interception studies in the United States, pp. 137-161. In W. E. Sopper and H. W. Lull, International Symposium on Forest Hydrology. New York: Pergamo