Seeding Annuals and Perennials in Natural Desert Range[1]

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Highlight

Seeding of pasture plants in a desert in a 78-mm rainfall year resulted in complete failure of all perennials to establish themselves. Annuals, on the other hand, in spite of stunted growth, completed their life cycle and produced seed. Water-spreading is a prerequisite for successful establishment of perennial pasture plants under desert conditions.

In many desert environments the pasture vegetation has been destroyed by overgrazing so that range seeding is necessary to reclaim the pasture resources. To that end, a range research program was initiated at the Avdat Desert Research Center in the central Negev of Israel (30° 47′ N lat., 35° 46′ E long., alt. 550 m). This program deals mainly with range development under water-spreading conditions, and has been reported elsewhere (Evenari et al., 1963, 1964, 1965; Tadmor et al., 1966). A preliminary investigation, carried out in 1960–61 to study range seeding under the *natural* desert conditions, i.e., without supplemental water, is reported here. Annual rainfall averages 86 mm, from November to April, with wide inter-seasonal fluctuations (Shanan et al., 1967). The period from May to October is usually completely dry. Mean daily, mean maximum and mean minimum temperatures for the hottest month (August) are 25.0 C, 32.4 C, and 18.2 C, and those for the coldest month (January) are 10.5, 15.0, and 5.3 C, respectively.

Table 1. Development of pasture plants under natural desert conditions. AVDAT 1960/61. Seeded January 26, 1961. Total rainfall 78 mm.

Species	Origin	Final development, May 10, 1961				
		Height of leaves (cm)	Stalks per plant (No.)	Height of stalks (cm)	Depth of roots (cm)	Dry weight (g/m²)
Annuals						
Avena sterilis L. (red wild oats)	local	6.5	3	24	15	36.4
Lolium rigidum Gaud. (Wimmera ryegrass)	local	10	3	12	18	7.6
Medicago polymorpha L. (burr clover)	local	4	–	–	12	3.0
M. polymorpha L.	local	3	–	–	13	6.5
Vicia dasycarpa Ten. (woolly pod-vetch C.v. Lana)	California	13	–	–	16	14.0
Perennials						
Agropyrum elongatum (Host.) P.B. (Tall wheatgrass)	local	1	2	4	0.5	4.7
Dactylis glomerata L. (Orchard grass)	local	*	*	*	*	0.3
Festuca arundinacea Schreb. (Tall fescue)	local	*	*	*	*	2.7
F. arundinacea Schreb.	Morocco	7	1	–	5	2.4
Oryzopsis holciformis (M.B.) Richt. (mountain ricegrass)	local	2	2	4	2	11.0
O. miliacea (L.) Benth. et Hook (smilo)	local	7	1	7	7	1.5
Phalaris tuberosa L. (Harding grass)	California	14	5	4	6	5.5
P. tuberosa L.	Cyprus	7	1	2	12	6.8
P. tuberosa L.	local (Moledet)	7	1	3	4	8.2
P. tuberosa L.	local (Yoqne'am)	7	1	5	6	2.6
Sanguisorba minor Scop. (Burnet)	Newe Ya'ar	*	*	*	*	0.7

* Very patchy development, isolated plants only.

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Methods

The soil is a non-saline, deep light sandy loam (loess). The seedbed was prepared by plowing 25 cm, and then raking. Sixty kg/ha of nitrogen was applied as ammonium sulphate and 120 kg/ha P_2O_5 as superphosphate. Seeding was carried out with a planet hand-seeder on January 26, 1961, when the soil was wet to a depth of 15 cm. Two to four replicates of 16 m^2 each, of each species, were then drilled in 1-m spaced rows to 2 to 4 cm depth at a seed rate of ca. 10 kg/ha.

Results and Conclusions

Total annual rainfall in the winter of 1960–61 was 78 mm, which is close to the long-term seasonal average. Prior to seeding, 36 mm rain had fallen, including 8.4 mm during the preceding week; 13 mm fell immediately following seeding, and 26 mm more within one month. Most species germinated and emerged satisfactorily, but all plants were severely stunted (Table 1). The annuals flowered within 6 to 10 weeks of emergence, and produced seed, though yields were very low. Most perennials, on the other hand, never advanced beyond the seedling stage. While flowering stalks were formed in a few species, neither seed nor bulbs were produced. None of the perennial plants survived the summer. Development of *Agropyrum elongatum, Oryzopsis holciformis,* and *Phalaris tuberosa* was relatively better and full seedling rows were observed. *Dactylis glomerata, Festuca arundinacea, Oryzopsis miliacea,* and *Sanguisorba minor* emerged very patchy and made hardly any growth at all.

In subsequent work reported elsewhere (Evenari et al., 1963, 1964, 1965, 1968; Tadmor et al., 1966) both perennial and annual range plants were very successfully grown in the same desert under water-spreading conditions. The above results, obtained in a year with average rainfall distributed in a way conducive to seedling development, stress the fact that seeding perennial range plants is doomed to failure unless additional water is applied. Water spreading is thus a prerequisite for establishing perennial plants in range seeding in the Negev Desert. Annual plants, however, were able to mature and produce seed. This shows the greater flexibility of annuals under the extreme conditions described, and also why ephemeral annuals constitute a major component of the native vegetation in many semi-deserts and deserts.

LITERATURE CITED

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