

1-1-1963

Crownvetch in West Virginia

Joseph D. Ruffner

John G. Hall

Follow this and additional works at: https://researchrepository.wvu.edu/wv_agricultural_and_forestry_experiment_station_bulletins

Digital Commons Citation

Ruffner, Joseph D. and Hall, John G., "Crownvetch in West Virginia" (1963). *West Virginia Agricultural and Forestry Experiment Station Bulletins*. 487.

https://researchrepository.wvu.edu/wv_agricultural_and_forestry_experiment_station_bulletins/456

This Bulletin is brought to you for free and open access by the Davis College of Agriculture, Natural Resources And Design at The Research Repository @ WVU. It has been accepted for inclusion in West Virginia Agricultural and Forestry Experiment Station Bulletins by an authorized administrator of The Research Repository @ WVU. For more information, please contact ian.harmon@mail.wvu.edu.


Ag-Eng. Library 7
West Virginia University



Crownvetch

IN
WEST VIRGINIA

West Virginia University
Agricultural Experiment Station



Digitized by the Internet Archive
in 2010 with funding from
Lyrasis Members and Sloan Foundation

Crownwetch

IN WEST VIRGINIA

by

Joseph D. Ruffner

and

John G. Hall

**WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION**

THE AUTHORS

The authors of *Crownvetch in West Virginia* are Joseph D. Ruffner, Plant Materials Technician, Soil Conservation Service, United States Department of Agriculture, and John G. Hall, Land Reclamation Specialist, West Virginia University Agricultural Experiment Station.

PHOTOGRAPHS

The photographs used on the cover and in Figure 2 are by David R. Creel, Experiment Station Photographer. The other photographs were taken by personnel of the Soil Conservation Service, United States Department of Agriculture.

WEST VIRGINIA UNIVERSITY
AGRICULTURAL EXPERIMENT STATION
COLLEGE OF AGRICULTURE, FORESTRY, AND HOME ECONOMICS
A. H. VANLANDINGHAM, DIRECTOR
MORGANTOWN

FOREWORD

Soil stabilization is critical in many areas where land reclamation is involved, especially on strip mine spoils, roadbanks, streambanks, and the like. The establishment of a vegetative cover is very desirable.

Crownvetch appears quite promising as a desirable plant for reclamation use. The Soil Conservation Service in cooperation with the Agricultural Experiment Station has made a number of test plantings of crownvetch alone, and in combination with grasses and other legumes to evaluate its use on critical areas. It may be that the scarcity of seed can be considered to be one of the obstacles preventing a wider use of crownvetch in soil conservation and land reclamation work. Several aspects of seed production are being investigated at the present time.

The West Virginia University Agricultural Experiment Station is pleased to present this information at this time, with the hope that it will encourage greater use of crownvetch, which seems to be well adapted to many areas in West Virginia.



A. H. VANLANDINGHAM

Director

Agricultural Experiment Station

CROWNVETCH in West Virginia

JOSEPH D. RUFFNER and JOHN G. HALL

CROWNVETCH, *Coronilla varia* L., is a perennial herbaceous legume, native to Europe, that is deep-rooted, winter-hardy, drought-tolerant, and tolerant to light shade. Semi-reclining in growth, the mature plant has coarse stems three to five feet in length. Its total vertical height is usually about two and one-half feet. It does not climb or vine.

Crownvetch blooms from mid-June to August. The blossoms vary in color from whitish-pink to purplish-pink. Seed is produced in long, narrow, cylindrically-shaped pods, which are segmented into from five to seven segments. When dry, the pods break into the individual segments, each about one-fourth inch in length. Each segment contains a single seed.

Crownvetch can spread by seed or by fleshy rhizomes. When seeded with the proper technique, it is easily established, although a special legume inoculant is required. The plant reaches maturity in the second year.

The plant is not a true vetch, such as the *Vicia* species. Its botanical name is *Coronilla varia*. *Coronilla*, meaning "little crown," is characteristic of the crown-shaped blossoms. *Varia* is used because of the variations in the colors of the blossoms and in the growth habits of the species.

Three varieties of crownvetch are available commercially, in both certified and uncertified seed. *Chemung*, developed by the Soil Conservation Service, United States Department of Agriculture, at its Big Flats, N. Y., Plant Materials Center, has superior seedling vigor and recovery from cuttings. Its rate of establishing cover during the first year is superior to other varieties. *Emerald*, developed by SCS for use in the Cornbelt area, is similar to *Chemung* in appearance but lacks its vigor. *Penngift*, developed by Dr. Fred Grau of The Pennsylvania State University Agricultural Experiment Station, has finer leaves and stems than either *Chemung* or *Emerald*, and is about six inches shorter in total height.

Performance in West Virginia

The Soil Conservation Service became interested in crownvetch as a cover plant in 1942. Trials and evaluations of the species in New York showed it to be well-adapted for critical area stabilization. In



FIGURE 1. Crownvetch is frequently confused with hairy vetch, probably because of similarity of name and general appearance. A number of characteristics serve to accurately identify either species. Crownvetch has leaflets at the tip of the leaf, blooms with pinkish-white to pinkish-purple round and compact blossoms, and produces seed in long, narrow, cylindrically-shaped pods which break into segments when mature. The true vetches have leaf tendrils at the tips of the leaves, purple blossoms with long, loose racemes, and produce seed in pods that resemble those of the bean plant. This is a photograph of crownvetch.

1951, a real effort was made to determine its adaptability and performance in West Virginia. Ten evaluation plantings¹ of *Chemung* crownvetch—on sites varying in fertility, degree of erosion, soil, and land use—were made over the period 1952-1954.² The results of these plantings were very favorable, and prompted additional trials to obtain information on techniques of seeding, rates of seeding, site limitations, effects of mowing or grazing, and fertility requirements.

The latter plantings, made between 1958 and 1962, consisted of a total of 54 seedings made on strip mine spoils, roadbanks, cuts, fills, eroded sites, and other problem areas. Although it is too early to fully evaluate all of these plantings, many have developed sufficiently to permit a useful estimate of their potential effectiveness.

¹Evaluation plantings are small-sized plantings of one or more species or varieties of plants made under one or more cultural or management practices, in order to provide data for comparison with a standard plant, practice, or cultural method for a particular problem site.

²Observations of these sites, made in 1962, are reported in Table 1.

TABLE 1. STATUS OF EARLY EVALUATION PLANTINGS MADE TO DETERMINE THE ADAPTATION AND PERFORMANCE OF CROWNVEITCH AS A COVER PLANT FOR WEST VIRGINIA (1962 OBSERVATIONS)

| Location | Year Seeded | Site | Type of Management | Per Cent Cover* | Remarks |
|--|-------------|------------------|----------------------|-----------------|---|
| Berkeley County (Kearneysville Exp. Farm, WVU Agr. Exp. Sta.) | 1952 | Orchard | Mowed and fertilized | 70 | Stand slowly increasing |
| Monongalia County (WVU Forestry Woodlot) | 1952 | Roadbank | None | 100 | Partial shade, spreading |
| Hampshire County (Blair Saville Farm) | 1952 | Orchard** | Mowed and fertilized | 70 | Mowed and disked, no spreadout of seeded area |
| Hampshire County (W. J. Thompson Farm) | 1952 | Orchard** | None | 70 | Abandoned, but good cover at low fertility |
| Wirt County (Harry Matheny Farm) | 1953 | Roadbank | Mowing | 30 | Frequent mowing and some grazing |
| Monroe County (W. J. Whorley Farm) | 1953 | Earth dam | Mowing | 70 | Slowly increasing, cover superior to grass |
| Hampshire County (Romney Orchard) | 1953 | Orchard** | Mowed and fertilized | 100 | Heavy organic matter buildup, cover better than grass |
| Ohio County (Bear Rock Lake State Park) | 1954 | Cut for spillway | None | 70 | Percentage of legume increasing annually |
| Ohio County (Andrew Hess Farm) | 1954 | Critical area | Mowing | 70 | Spreading and providing dense cover |
| Jackson County (Cedar Lakes FFA Camp) | 1954 | Cut for spillway | None | 80 | Erosive and steep site well protected |

*Actually provided by crownvetch. Does not include grass or other vegetation.

**Shallow shale soil.

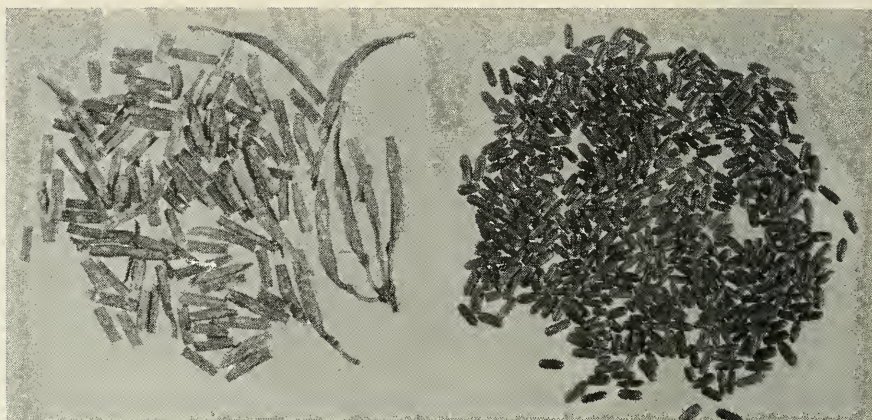


FIGURE 2. Cylindrically-shaped seed pods (left) of crownvetch break into from five to seven segments when dry; each segment contains a single light-brown seed (right). Seed must be treated with a crownvetch inoculant before planting.

Strip Mine Spoil Banks

Twenty-two of the plantings made from 1958 to 1962 were on strip mine spoils. Nineteen were "frost" seeded on unprepared outslopes that were not limed. The sites ranged from 1/200 of an acre to one acre in size. A seeding rate of 20 pounds per acre was found to be sufficient when crownvetch was seeded alone. A mixture of 20 pounds ryegrass and 15 pounds crownvetch per acre provided cover more quickly than did crownvetch alone. Fertilization at the rate of 500 pounds of 10-10-10 per acre, applied at seeding time, improved cover about 20 per cent the first year; however, on some sites little difference was noted between fertilized and unfertilized areas by the end of the second growing season. On spoils more acid than pH 5.5, fertilizer had no effect on stand establishment. At present, this acidity level is considered to be the lower limit for stand establishment, regardless of site and fertility level.

Table 2 lists the cover ratings for crownvetch plantings on outer-slopes.

TABLE 2. CONDITION OF CROWNVETCH PLANTINGS ON OUTERSLOPES OF STRIP MINE SPOIL BANKS (1962 OBSERVATIONS)

| Number of Plantings | Age When Evaluated | Soil pH | Cover Rating |
|---------------------|--------------------|------------|--------------------------|
| 9 | 2 to 4 years | above 5.5 | 2 excellent, 7 very good |
| 3 | 1 year | above 5.5 | 2 good, 1 fair |
| 7 | 2 to 4 years | 4.0 to 5.0 | 7 failures |

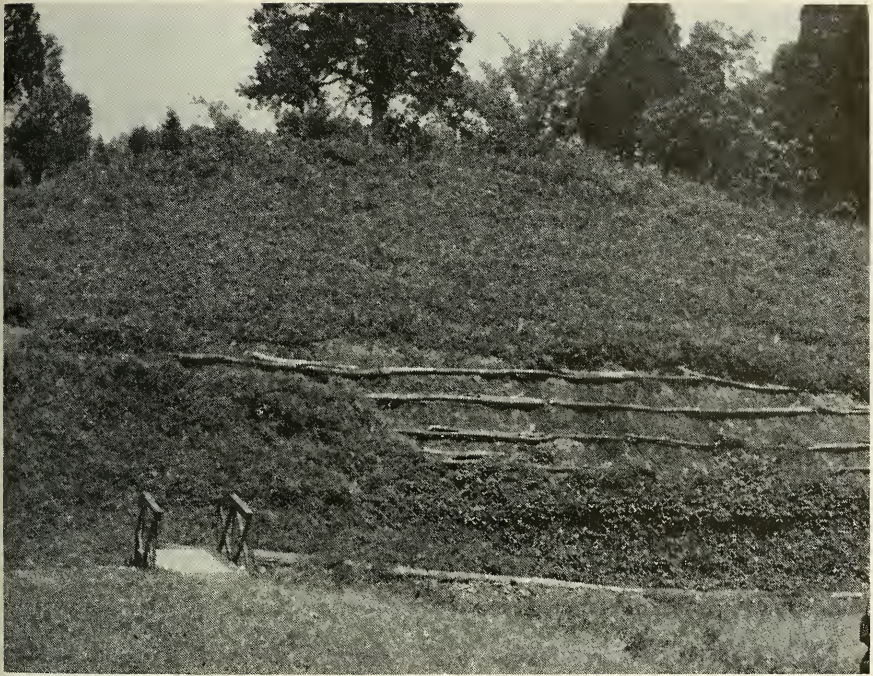


FIGURE 3. Crownvetch planting on cut for emergency spillway at Cedar Lake Future Farmers of America Camp at Ripley. The planting, eight years old, is on highly-erosive Upshur silty clay loam. Crownvetch covers the entire cut, except for the practically-vertical outcropping near the center.

Where crownvetch was seeded in conjunction with black locust seedlings, it provided 100 per cent cover during the second year. At the end of the fourth year, the black locust was forming a nearly-closed canopy, but the shade did not diminish the cover provided by crownvetch.

Five plantings were made to compare sericea lespedeza with crownvetch on outslopes with pH above 5.5. Frost seedings were made of both species, with seed scarified and inoculated. Good or better cover was achieved with the crownvetch within two years. Only one of the sericea plantings rated as fair cover, the others were failures.

Livestock had access to one of the spoil areas, where two half-acre plantings existed. Although grazing was not intensive, the cattle did graze enough to indicate that crownvetch is palatable to livestock.

Three frost seedings of crownvetch were made on well-fertilized leveled spoils that were nearly neutral in pH. Although emergence was good, satisfactory stands failed to develop. The spoil texture, a silty clay loam, was heavily compacted.



FIGURES 4 and 5. A frost seeding of crownvetch on an outerslope of a Harrison County strip mine spoil, made in the spring of 1960. Figure 4, upper picture, was photographed at the end of the first growing season, and Figure 5, above, shows the site two years later. Note 100 per cent cover by crownvetch.

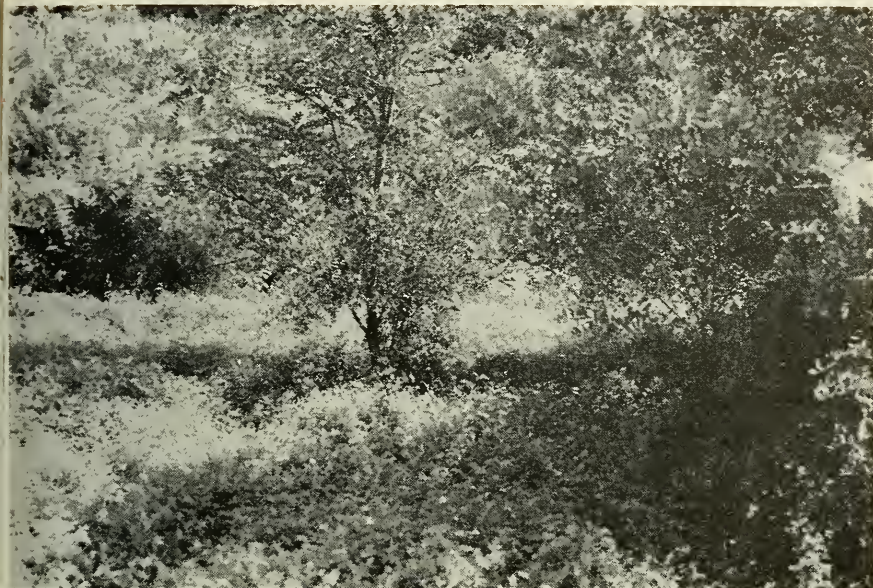


FIGURE 6. A four-year-old frost seeding of crownvetch on strip mine spoil in Preston County. The black locust seedlings were planted at the same time as the crownvetch. Note degree of cover provided by each species.

An additional seeding on heavy-textured leveled spoil, made on a seedbed prepared and fertilized for birdsfoot trefoil and orchard grass, produced a fair stand after three years and is continuing to improve.

Recent studies indicate that depth of seeding and soil texture can affect germination and emergence in crownvetch.³

Roadbanks

Conventional Seedings. Eleven sites were limed to pH 6.5, fertilized with 1,000 pounds of 10-10-10, and mulched with one and one-half tons or more of straw per acre before seeding. Then they were seeded with a crownvetch-tall fescue mixture, in the proportion of 20 pounds crownvetch and 30 pounds tall fescue per acre.

Nine of the sites, after the second year (1962), have good to excellent cover. Two sites have only fair cover, but stands are steadily improving. On the sites where cover is below standard, it is believed that this may be due to the mulch not being secured and the seed washing from the site. Also, seeding was unduly delayed after the mulch and fertilizer were applied.

³See *Low Growing Vegetation for Steep Slopes*, written by Wood, Thornton, and Williams of the USDA-SCS National Plant Materials Center, Beltsville, Md.



FIGURE 7. One-year-old seeding of crownvetch on roadbank on W. Va. Route 39, about eight miles west of Mill Point. The bank was bare when seeded. The site, with an elevation of 3,928 feet, was selected to evaluate winter hardiness of crownvetch.

Frost Seedings. Three sites, with partial grass cover, were frost seeded. On two of these the soil acidity was pH 5.5 or better, and fair to good stands developed. On the third site the soil acidity was pH 5.0; the planting here was a failure.

Plantings for Comparison. Roadbank seedings of crownvetch, grasses, and other legumes were made in 1959 on U. S. Route 19 north of Summersville, in south-central West Virginia. The object of these seedings was to provide a basis for comparing crownvetch with other species and mixtures of species from the standpoint of establishing effective cover quickly and the durability of cover with equal maintenance.

Plantings of the individual species, in addition to crownvetch, included birdsfoot trefoil, sericea lespedeza, tall fescue, tall oatgrass, and red fescue. The mixtures seeded were crownvetch and tall fescue, birdsfoot trefoil and tall fescue, and sericea lespedeza and tall fescue. The seedings were made on plots 100 by 20 feet in size, which had been limed to pH 6.5. The grass plots were fertilized at 1,000 pounds of 10-10-10 per acre, the legumes plots at 1,000 pounds of 2-12-12 per

acre, and the grass-legume mixtures plots at 1,000 pounds of 5-10-10 per acre. Table 3 gives the evaluations of these plantings over a four-year period.

TABLE 3. PER CENT COVER PROVIDED BY SPECIES AND MIXTURES OF SPECIES, SEEDED IN 1959, ACCORDING TO AGE OF STAND*

| Species | Year Observed | | | |
|-----------------------------------|---------------|------|------|------|
| | 1959 | 1960 | 1961 | 1962 |
| Crownvetch | 10 | 40 | 100 | 100 |
| Birdsfoot trefoil | 5 | 20 | 40 | 50 |
| Sericea lespedeza | 0 | 0 | 5 | 10 |
| Crownvetch + tall fescue | 40 | 90 | 100 | 100 |
| Birdsfoot trefoil + tall fescue . | 30 | 65 | 85 | 85 |
| Sericea lespedeza + tall fescue . | 40 | 50 | 40 | 30 |
| Tall fescue | 50 | 80 | 70 | 70 |
| Tall oatgrass | 75 | 90 | 80 | 60 |
| Red fescue | 75 | 90 | 75 | 40 |

*Poor stands resulting the first year were due to droughts and severe erosion. All plots were topdressed with 2-12-12 at a rate of 800 pounds per acre, and poor grass stands were reseeded in spring of 1960. This accounts for the increased cover of grass plots the second year.

Other Problem Areas

Crownvetch was seeded on a wide range of problem areas and under a variety of conservation practices to determine its adaptability and performance. Problem soils included the shallow shale soils of the eastern part of the State and the highly-erodible red shales in the Ohio Valley. Conservation problem areas included cuts and fills, and the stabilization of streambanks, farm ponds and large retention dams.

Good stands of crownvetch were established on 80 per cent of the 19 sites, and at the end of two years provided better cover than any of the species used for comparison. It was quite superior to other species on excessively stoney and gravelly sites. Good stands, in combination with woody shrubs, were effectively established on streambanks.

Shallow Shale Soils. Two field-evaluation plantings on droughty, low-fertility shale soils in the Potomac Valley area indicate that crownvetch is superior to all other legumes tried as cover plants. The trial plantings included crownvetch, alfalfa, Ladino, red and alsike clovers, sericea and Korean lespedezas, and birdsfoot and narrow-leaf trefoils.

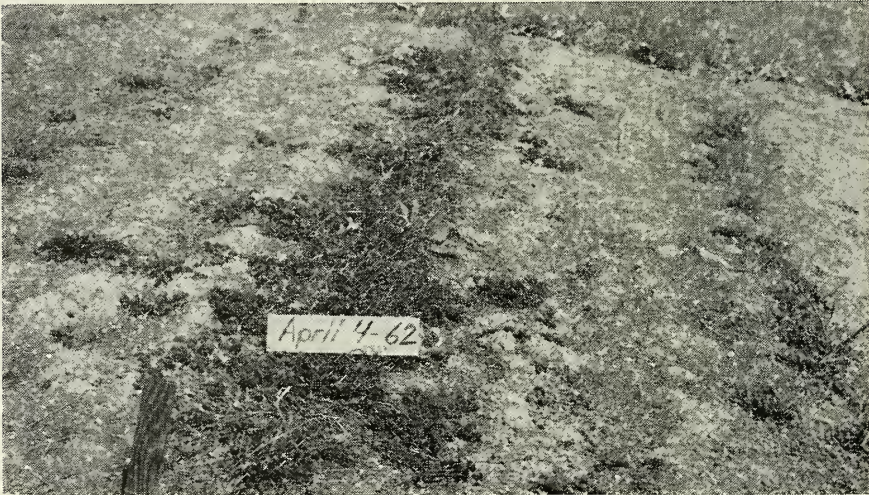
Rod row and milacre plantings were made to compare the performance of crownvetch with other legumes and grasses during all periods of growth. Sericea lespedeza, the legume used most frequently

in this area for cover plantings, was the standard of comparison. After three years of observation, crownvetch was found to be superior for its vigor, spread, density of cover, length of growth period, winter cover, and buildup of organic matter. Spring recovery was equal to that of birdsfoot trefoil, but its growth in the winter months and drought tolerance far exceeded that of the trefoils.

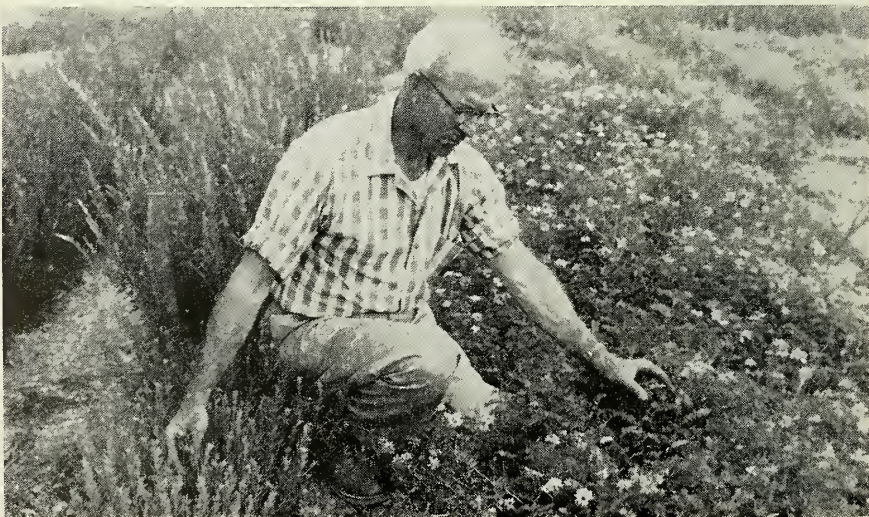
Seed Production on Shallow Shale Soils

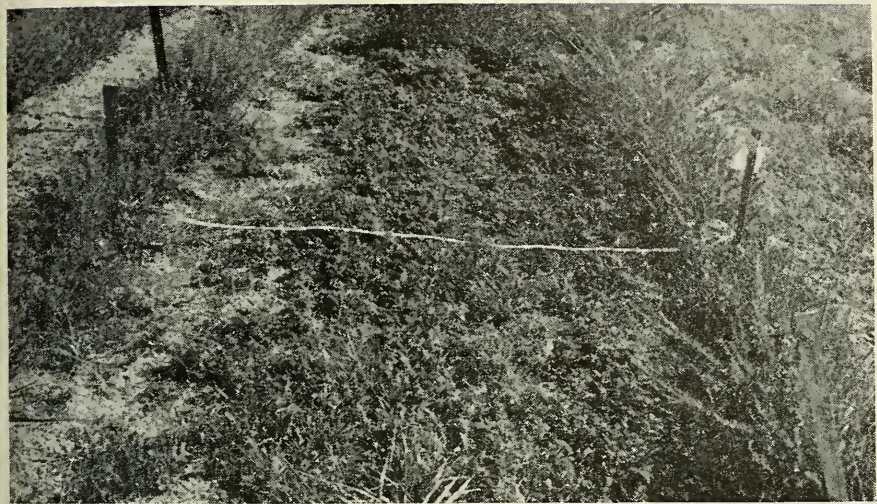
A limiting factor in crownvetch seed production in the Northeast is the abundance of vegetative growth made by the plant prior to and

[8]



[9]





FIGURES 8, 9, and 10 are photographs of an evaluation planting comparing crownvetch with sericea lespedeza at Moorefield. The plantings, made on a critical site in 1961, consist of 20-foot rows of each legume alternately spaced three feet apart. Figure 8, photographed April 4, 1962, shows early spring recovery and vigorous rhizome spreading habit of crownvetch. New plants may be observed up to 18 inches from the center of the row. The lespedeza did not make spring recovery until three weeks later. Figure 9 was photographed June 25, 1962. Rows in the foreground were clipped on May 31. Note the vigorous recovery of the crownvetch, with its superior spread and density of cover. Figure 10 was photographed October 12. Both rows had been clipped three times. The crownvetch, through rhizomatous growth, has spread almost three feet in both directions. Although the lespedeza shows heavy top growth, it has not filled in between rows.

during the reproductive stage. Seed set is from early June to late August. On fertile sites where there is moisture, vegetative regrowth will start again in July and the resulting foliage shades the immature seed pods, hindering their development. Seed yield is thus greatly reduced.

Soils that are characteristically droughty and low in fertility to the point of becoming problem soils for forage production may be suitable for seed production with crownvetch. The lack of moisture and nutrients does not support the abundant vegetative regrowth that interferes with seed development and maturity.

The shallow shale soils of the Eastern Panhandle of West Virginia are normally droughty and low in fertility. Forage production in this area usually becomes critical after mid-June. In 1960, field-evaluation trials involving a number of species were started in Hardy County. The purpose of the trials was to determine the species that would be most desirable for stabilization and forage. Crownvetch was included, and grew vigorously during periods of drought. In view of this, observers became interested in its seeding habits and yields.



FIGURE 11. Crownvetch in West Virginia reaches maturity in early August. This photograph shows relative height growth and semi-reclining habit. Its habit of a long blooming period produces seed at different stages of development. Seed production on rod row and milacre plantings at Moorefield averaged 354 pounds per acre in 1962.

By 1962, full stands were present in all crownvetch plots. Seed was harvested from seven plots and sent to the Big Flats Plant Materials Center for cleaning. The average yield of the seven plots was 334 pounds per acre; individual plot yields ranged from 124 to 453 pounds per acre.

Rainfall distribution during the growing season was better than normal in the area, and early vegetative growth was vigorous and bloom was heavy. Vegetative regrowth during midsummer was limited, however, and this permitted seed to form and mature without hindrance from shade. One of the seed-production plots is shown in Figure 11.

Average crownvetch yields at the Big Flats Plant Materials Center are about 150 to 200 pounds per acre.

Additional information on growing crownvetch for seed production is contained in the mimeographed report *Crownvetch Seed Production*, by Curtis Sharp. Copies may be obtained by contacting the USDA-SCS Big Flats Plant Materials Center, Big Flats, N.Y.

Seeding Methods for Crownvetch

Planting sites for crownvetch should be limed and fertilized if needed, and these materials should be raked in lightly. Inoculate the seed with the proper inoculant; crownvetch will not grow well without this treatment.⁴ Broadcast seed uniformly, seeding the grass and the legume separately. Table 4 contains information regarding rates and dates of seeding.

On excessively steep slopes, straw must be applied before seeding. This prevents the seed from rolling off the site. The straw mulch should be uniformly applied, and anchored if necessary.

Evaluating a New Seeding

Scarified crownvetch seed will usually have a total germination of about 85 to 90 per cent, of which 20 to 25 per cent is hard seed. In new seedings, the emergence of new plants continues throughout the growing season, with the greatest emergence occurring within 10 to 20 days following seeding.

First-year seedling growth is slow. As a rule, spring seedings at the end of summer look like poor stands when compared with forage-type seedings. A single crownvetch plant per square foot of area at the end of the first season is considered to be a very good stand. A single strong plant, with 8 to 10 inches growth, per each 3 square feet of area can be expected to provide a suitable stand the following year.

Of the three crownvetch varieties available commercially, *Chemung* has the best seedling vigor under most conditions. For this reason it is particularly well-adapted to the more critical sites.

Summary

Sixty-four crownvetch evaluation plantings were established on a variety of critical conservation problem sites during the period 1952-1962. Good or better cover was established on more than 80 per cent of the sites.

Crownvetch produced a more dense cover earlier than sericea lespedeza on roadbanks, shallow shale soils, and strip mine spoil where the spoil acidity was above pH 5.5. Frost seedings produced successful stands on roadbanks and strip mine spoil outerslopes. Poor stands consistently resulted from frost seedings on compact, heavy silty clay strip mine spoil.

⁴Inoculants for crownvetch seed are available from most inoculant companies. That used in the plantings reported in this bulletin was obtained from Nitragin Company, Inc., Milwaukee, Wisc.

TABLE 4. SITE PREPARATION, MIXTURES, AND DATES OF SEEDING FOR CROWNVELTCH

| Site | Lime | Fertilizer (lb./Acre) | Suggested Seeding Dates | Straw Mulch (Ton/Acre) | Seed Mixture (lb./Acre) |
|---|-------------------|--------------------------|---|---------------------------------------|--|
| New roadbanks, earth dams, cuts and fills, etc. | Lime to pH 6.5 | 1000 lb. 10-10-10 | April 1 to May 15 July 15 to Aug. 15 Oct. 15 to Nov. 15 | 1½ ton* 2 ton 2 ton | 20 lb. Crownvetch and 30 lb. Tall fescue 20 lb. Crownvetch and 30 lb. Tall fescue 20 lb. Crownvetch and 30 lb. Tall fescue† |
| Old roadbanks,‡ etc., with partial grass cover. | Lime to pH 6.5 | 400 lb. 0-20-20 | Frost seed on or before March 15 | (Optional) 1½ ton on bare areas | 10 to 20 lb. Crownvetch |
| Strip mine spoil outerslopes—pH 5.5 or above | None | None | Frost seed on or before March 15 | None | 15 lb. Crownvetch and 20 lb. Ryegrass or 20 lb. Crownvetch |
| Seed production** | Lime to pH 7.0 | 400 lb. 0-20-20 | April 1 to May 15 | None | 8 to 10 lb. Registered Crownvetch seed |

*On steep slopes, straw mulch must be held in place. This can be done by use of an asphalt emulsion, paper netting, twine and wood pegs, or with lightweight poles, saplings, or brush.

†Seed grass only in the fall. Frost seed crownvetch about March 15.

‡No more than 50 per cent cover.

**Refer to Crownvetch Seed Production publication.

Seeding rates of 20 pounds per acre in conventional roadbank seedings appear to be adequate when used with a grass, such as tall fescue at 30 to 40 pounds per acre. Cover was improved during the first year or so by including grass with the crownvetch. A complete fertilizer increased cover of crownvetch on strip mine spoil about 20 per cent during the first year.

The legume was winter hardy at 4,000 feet elevation and withstood the drought on the shallow shale soils found in the Eastern Panhandle of West Virginia. It established well as an overseeding with shrubs and tree plantings, and tolerated semi-shaded sites.

Four plantings, eight to ten years old, continued to grow satisfactorily without maintenance.

No attempt was made to specifically evaluate the effect of exposure on stand establishment and rate of effective cover. However, it was observed that in plantings more than a year old, cover developed faster on sites exposed to the north and east. Approximately 75 to 90 per cent of these sites had good or better cover, while southern and western exposures had only 25 to 50 per cent good and better stands.

In 1962 a bountiful seed crop was harvested from crownvetch growing on shallow shale soils in the Eastern Panhandle of the State.
