For Erosion Control, 'No Maintenance,' and Beauty:

CROWNVETCH

ONCE YOU KNOW the characteristics of Crownvetch, you'll think of any number of uses. Its adaptation to environmental variations and omnipotence over natural and man-made destructive forces are that outstanding.

This broad endorsement is not to imply that Crownvetch is *the plant* for all purposes; rather, it conveys the opinion that the plant has qualities that make it supreme for a wide variety of uses.

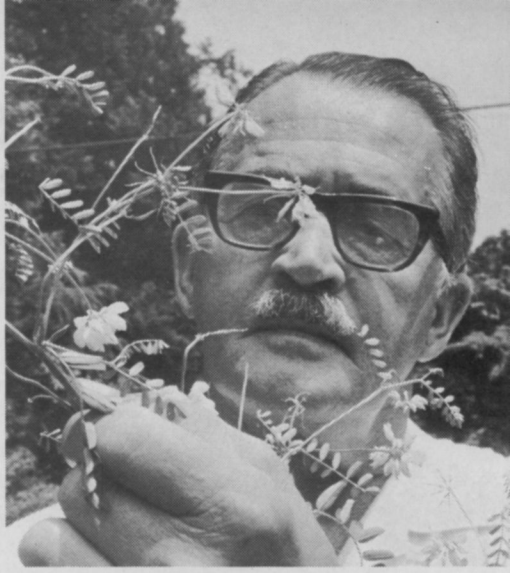
For openers, Crownvetch, *Coronilla varia,* is described as having extreme drought and cold tolerance and almost complete freedom from insect disease troubles. It flourishes in extremely poor soil, and crowds out grasses and weeds. Hedging not at all, proponents state Crownvetch has "zero maintenance." And in the words of its discoverer, Crownvetch is "utterly beautiful," blooming in colors from white to pink to reddish purple flowers all summer long.

A perennial legume, Crownvetch seeds profusely and also spreads by strong fleshy rhizomes. The Penngift strain (others are Chemung and Emerald) has coarse stems from two to six feet long that are strongly branched. Numerous rhizomes may develop to 10 feet or more, with new plants rising from the nodes.

Crownvetch is known best for its use to control erosion on highway slopes. Says Dr. Fred Grau, discoverer and founder of the Crownvetch industry:

"Every slope is an advertisement for Crownvetch, whether it has been planted or not. Once you've seen slopes covered with a Crownvetch blanket, you wonder why other slopes haven't been protected in the same way."

Those who might not agree with Dr. Grau's opinion of the beauty of its pink and purple flowers and deep green foliage, nevertheless will be impressed by another contribu-



Dr. Fred V. Grau, College Park, Md., founded the Crownvetch industry. He discovered the plant growing near Virginville, Pa., in 1935. He later formed his own company, Grasslyn, Inc., to produce and market seed. He's holding a white-flowering strain he hopes to market in the future. It's growing on a vacant lot in College Park near his home.

tion characterized by the color green —money.

Pennsylvania highway officials estimate that the 18,000 acres of Crownvetch planted along rights-of-way since 1947 are now saving taxpayers in excess of $100,000 annually in mowing costs alone.

No estimate is possible on the amount of money saved that would have been used in rebuilding slopes that had eroded away.

The great opportunity for the Crownvetch industry, believes Dr. Grau, is in "revitalizing eroding, degenerating grassed slopes which have been improperly maintained. Success has been remarkable when Penngift Crownvetch seed has been hydroseeded into the gullied slopes without seedbed preparation."

Crownvetch is an ideal cover from the standpoints of beauty, erosion control, soil enrichment and "zero maintenance" for any hard-to-maintain area. Among these, Dr. Grau suggests medians on highways, slopes around factories, commercial buildings, parking lots, schools, parks and golf courses; ski slopes, cemeteries, strip-mined areas, and decorative plantings around homes.

Penn Central Endorses It

Penn Central Railroad has established Crownvetch around its Big Four Yard near Indianapolis. Penn Central right-of-way specialists see Crownvetch as a "valuable ally" in maintaining yards and roadbeds where mowing is extremely expensive and chemical control not always effective.

"Chemical weed killers," a Penn Central release stated recently, "frequently defoliate but leave stalks standing which obstruct vision along rights-of-way and grade crossings until they are removed. Crownvetch hugs the ground in a dense green mass and eliminates this problem entirely."

But doesn't the mass of vines constitute a fire hazard? In the truly dormant season, "no more than any other plant," replies Dr. Grau. He adds that Crownvetch more properly can be described as "fire retardant."

Because of the plant's exceptional drought tolerance, it stays green in extremely dry weather. Large quantities of moisture in its stems prevent flash fires as happen with grasses and weeds.

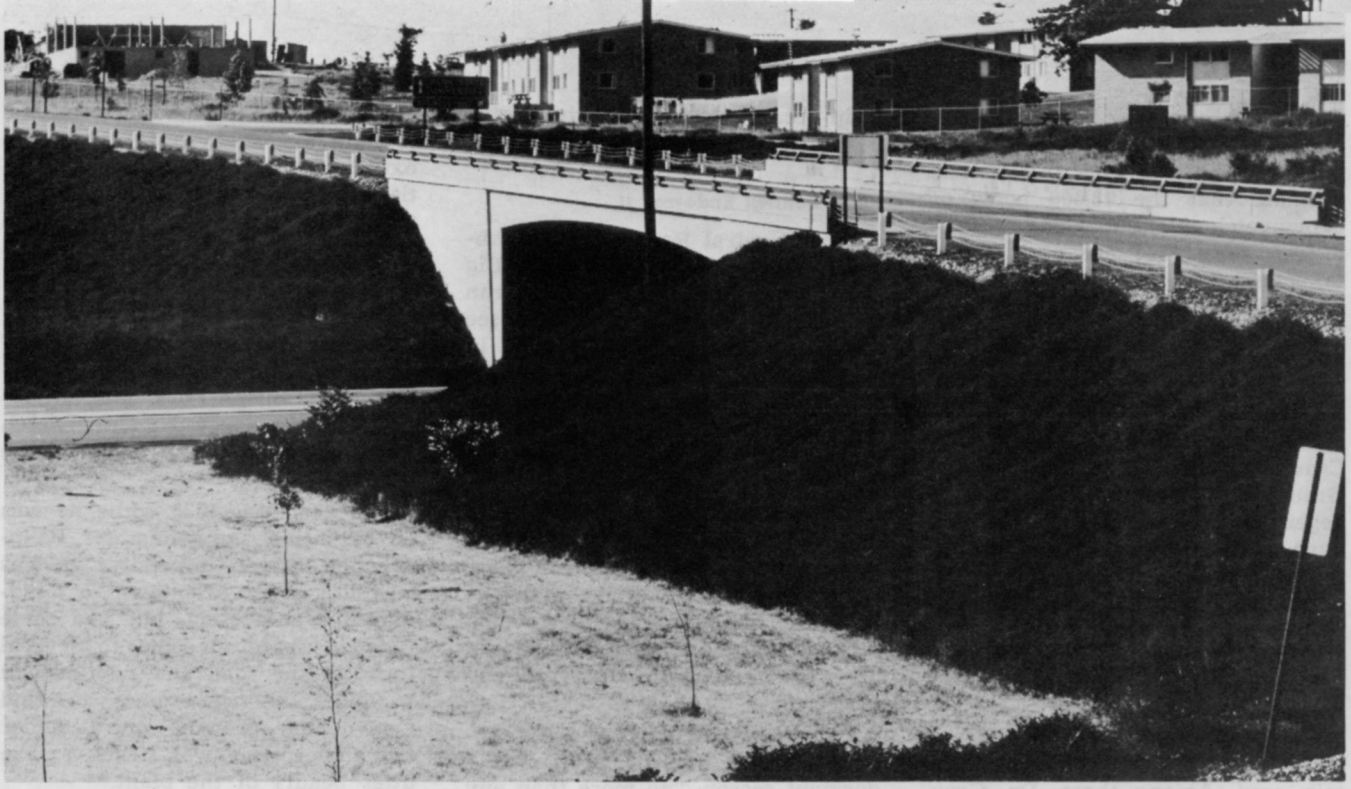
When and Where Discovered

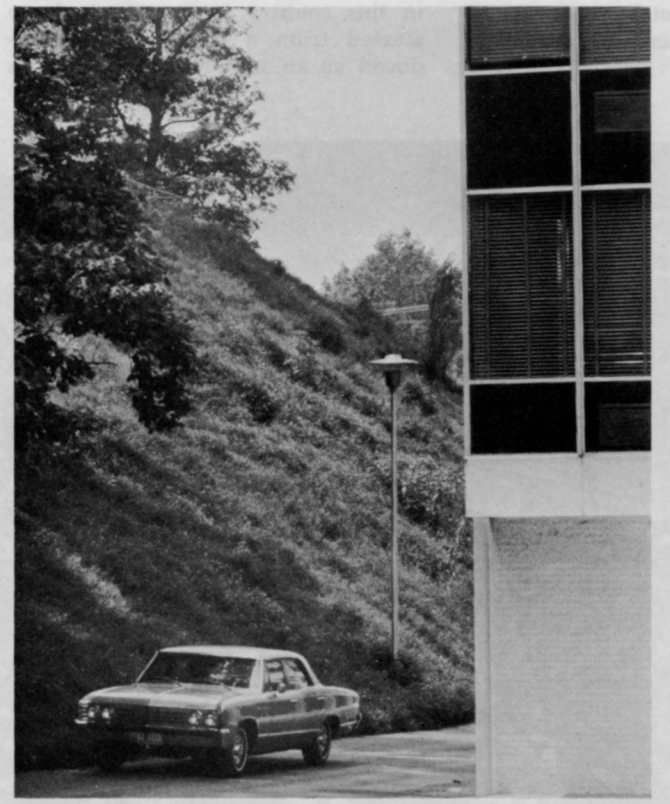
Dr. Grau, agronomist, world turf authority, and president of Grasslyn, Inc., College Park, Md., attributes his discovery of Crownvetch to his taking the right forks in the road.

The year was 1935 while he was an extension agronomist for Pennsylvania State University. "I was traveling from Allentown to Reading for a meeting, but had some time to spare. I came to several forks in the road and just happen to take the right ones to find Crownvetch growing on a cinder and shale pile. I was struck by the utter beauty of the plant."

The entire Crownvetch industry in this country is thought to have started from a single plant introduced as an impurity in an alfalfa

Highway interchanges, like the one at far left on Interstate 81 near Winchester, Va., are ideal places to plant Crownvetch. Mowing would have been practically impossible; cost of planting shrubbery prohibitive. The legume had covered almost everything except solid bedrock. Rights-of-way are steep and tiered in the mountainous region of Pennsylvania along Highway 322 northwest of Harrisburg. Crownvetch is working well to cut down erosion. Numerous uses, as for the lake bank above, serve both utilitarian and esthetic purposes.





Crownvetch offers a number of advantages over other types of plantings in urban areas. The legume soon envelopes and conceals trash. It stays a deep green through extremely dry weather, as shown above in State College, Pa., and moisture retained in its coarse stalks gives it fire-retardant qualities. Commercial developments on land carved out of hillsides have used Crownvetch to control slope erosion. The picture at left is a business office building in College Park, Md. At right, Crownvetch worked its way into crevices of this cliff edge to Pennsylvania Highway 322.

field sometime between 1905 and 1910. The site was the Robert Gift farm near Virginville, Pa. Because of Dr. Grau's discovery on the Gift farm and the university-sponsored research that followed, the name Penngift Crownvetch was assigned for identification purposes. Other varieties have been developed from Penngift with the help of Dr. Grau.

Dr. Grau hand-harvested some seed and collected some crowns from the Gift field and started a new planting for commercial seed production in 1940. The first commercial seed harvest was in 1946; the first ton produced in 1951. The Penngift name was assigned in 1954, and the first Blue Tag Certified seed came in 1961.

Before Dr. Grau could sell the seed to state or federal governments, he found that he had to establish his own competition to comply with

regulations requiring that more than one source be available for products purchased.

Dr. Grau, through Grasslyn, Inc., has some 2,000 acres in production now around State College, Pa., and Omaha, Neb.

Attesting to Penngift Crownvetch's ability to spread, Dr. Grau said a single clump planted eight years ago along Highway 36 near Omaha has now spread to 5,000 sq. ft.

The longest continuous highway usage, he said, is the recently completed Interstate 80 stretching from New Jersey to the Ohio line.

Though Pennsylvania has made greatest use of Crownvetch, Dr. Grau said seed or crown shipments had gone to 40 some states. It grows in most parts of the country, from almost the entire length of Trans-Canada Highway 401, to coal strip-mined areas of Kentucky to irrigation ditchbanks in El Paso, Tex. As other examples, you can view it at parks in Peoria, Ill., and Dallas, Tex.; on a golf course as Moselem Springs, Pa.; and on the slopes of a recharge water basin on Long Island.

But to really view Crownvetch "en masse," just take a drive through Pennsylvania.

University-Tested Since 1947

A joint research project by Pennsylvania State University and the state highway department was begun in 1947 to evaluate various legumes and grasses for slope control.

J. M. Duich, agronomist at Penn State, reporting at the first Crownvetch Symposium in 1964, summed up that early testing this way:

"The specific results of the tests showed that certain grasses produced an adequate cover but later showed evidence of serious thinning out, in spite of additional fertilization. In contrast, Crownvetch when seeded alone, established full cover by the end of the second full growing season, but because of the slow rate of seedling development, did not provide adequate protection during the first season of growth.

"It was very evident that, where grass-legume mixtures were used, the development of the legume was directly affected by the competition of the faster-growing grasses."

Because the study showed a grass-legume mixture to be the best for establishing a permanent cover, another series of tests was conducted to find which mixture was best.

In studies continued through 1961, Duich concluded that Crownvetch seeded with either red fescue, Kentucky-31, or domestic ryegrass provided excellent slope protection, with the Crownvetch taking over as the permanent cover after the second growing season.

Under the conditions of the experiment, the ryegrass-Crownvetch combination showed the best indication of permanent Crownvetch cover.

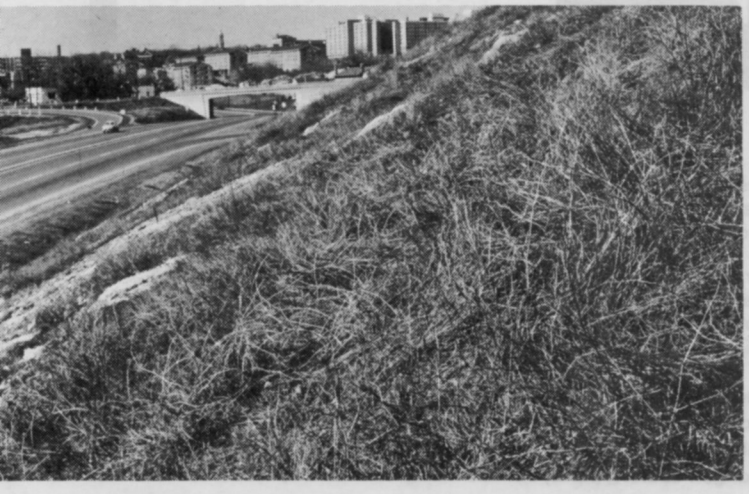
Seeding rates per acre ranged from 25 to 60 pounds of grass seed to 20-30 pounds of Crownvetch seed. The recommended rate at present from Grasslyn, Inc., is 20 pounds of Crownvetch and 40 pounds of either red fescue or ryegrass. (See Planting Suggestions).

Highway Department Evaluation

Also at the 1964 symposium, Pennsylvania roadside engineers D. R. Rodgers, H. P. Judd and R. S. Ross reported that Crownvetch had proved "highly satisfactory" on all roadside soils except where toxicity is apparently present. These soils ranged from silts to solid bedrock, with many sands, gravels, shales, clays and schists, they said.

"Benched cuts have permitted us

Penngift Crownvetch Planting Suggestions



From the top, Crownvetch is shown actual size in bloom (colors can be any shade from white to purple); seed pod; and in the dormant stage.

SEED

BEST TIME. Anytime slope is ready—spring, summer or fall.

INOCULATION. A must! Add fresh inoculant as directed on package. Use quadruple rate when hydroseeding to account for dilution. Dump into tank with seed, lime and fertilizer. Keep inoculant as cool as possible until used. Temperatures above 75-80 degrees F. weaken bacteria and make inoculant less effective.

LIME. Adjust pH levels to 6.5 to 7.0. Apply 2 tons ground agricultural limestone to the acre (100 lbs. to 1,000 sq. ft.) in absence of soil test.

FERTILIZER. Use 0-20-20 farm-grade fertilizer at 500 lbs./A and ureaform (38-0-0), Blue Chip Nitroform, Kapco-38, or equal at 400 lbs./A. Ureaform nitrogen is slowly soluble, non-leaching, non-burning, long-lasting, and gentle with the tender young seedlings. In large measure, it compensates for "no topsoil."

SEED RATE. 20 lbs. Blue Tag Certified Penngift seed to the acre.

COMPANION. 40 lbs. red fescue or ryegrass to the acre. In southern regions, use Kentucky 31 fescue at same rate. On small areas, use one pound of Penngift and one pound of companion per 1,000 sq. ft.

SEEDBED. Leave it rough and cloddy with stones and trash in place where no mowing is planned. Seed can be sown without seedbed preparation into weedy, grassy areas. Cutting the weeds and grass with a sickle or similar method on small areas will provide mulch.

MULCH. A must! Use two tons straw or hay to the acre, tied down with asphalt emulsion or by other method to hold mulch in place. On small areas, use two bales of straw per 1,000 sq. ft. tied down with twine or branches. Do not remove mulch.

HYDROSEEDING. For Penngift Crownvetch, use two-step method: STEP I—To water in tank add limestone, fertilizer, seed, inoculant and 200 lbs./A. wood cellulose pulp. The wood pulp acts as a "glue" to hold the seed tightly to the soil surface. STEP II—Immediately apply mulch. Mulch may be clean straw or timothy hay (with asphalt tack) at 2 tons/A. or wood cellulose pulp at 1,200 lbs./A. Long exposure between steps I and II will permit the sun and wind to kill the inoculating bacteria, which may result in failure.

OPTIONAL MANUAL METHOD OF INOCULATING FOR DRY SEEDING

1. Spread seed on tarpaulin.
2. Sprinkle lightly with a mixture of 9 parts water, 1 part molasses, or a sweet sweet soda pop. One-half pint of mixture should adequately moisten 100 pounds of seed.
3. Roll to alternate corners until all seeds are sticky-moist, not sloppy-wet.
4. Spread seed, scatter inoculant, roll again until each seed has black coating.
5. Spread seed, scatter cornstarch (½ lb. to 100 lb. seed) roll again to dry seeds for free-flowing quality.

OPTIONAL MECHANICAL METHOD OF INOCULATING FOR DRY SEEDING USING SMALL CEMENT MIXER

1. Load seed into mixer, agitate continuously.
2. Sprinkle with a mixture of 9 parts water, 1 part molasses. One-half pint to 100 lbs. seed.
3. Sprinkle inoculant.
4. When all seeds are coated black, sprinkle cornstarch (½ lb. to 100 lbs. seed).

CROWNS

BEST TIME. Anytime soil is not frozen or baked dry. Soil moisture is essential.

LIME AND FERTILIZER. As for seed, but spread two weeks before planting crowns.

SEEDBED. No special preparation. Crowns can be planted in bare soil or into existing cover.

SPACING. Staggered, on 3-ft. centers. Closer spacing will yield coverage sooner.

COMPANION. As for seed, sown just before applying mulch.

CARE. Keep crowns moist until planted. Pour soak-water on planted crowns.

PLANTING. Create vertical or slanting hole with mattock, pick-axe, or tree-planting tool. Pour water in hole, bury all but tip of crown, then firm soil to exclude air. Leave a depression or "rain-pocket" above crown to catch rain water. Never plant crowns in hot, dry soil.

MULCH. As for seed, but best applied before crowns are planted.

Linda Treichel of Penn Central's Cleveland Research Center staff, inspects the root system of Crownvetch. The low-growing, vine-like plant may be, according to the railroad's researchers, the answer to the rail industry's weed control problem. Penn Central Photo.

to seed Crownvetch on slopes up to 10 feet in height (slope measurement) and achieve establishment on gradients of ¼:1," they added.

At a second symposium, in 1968, Ross and Rodgers reported on four points of minor contention that exist: (a) Crownvetched roadsides are not attractive; (b) winter coloration is objectionable; (c) extensive mileage is monotonous; and (d) vetch smothers out and impedes regeneration of native plant material.

To answer the first point, they reported that in 1967 an estimated 1,500 to 2,000 unsolicited complimentary and informational contacts were received. To cut down on the mail load, numerous signs have since been installed along highways.

Ross and Rodgers contend that since Crownvetch is "golden brown" for a five-month period in Pennsylvania (of which two months are normally under snow) and winter tourists are fewest and least concerned with roadside scenery, the dormant unattractiveness factor is negligible.

Concerning monotony, they cited research that indicates highway pavement takes up 28% of the visual field at 60 mph and does much to channel views and distant panorama. "In Pennsylvania with the varying topography created by valleys, mountains, and rolling farmland, the problem of any specific roadside vegetation becoming monotonous is quite remote."

While Crownvetch does smother out grasses and weeds, Ross and Rodgers said there is plenty of evidence of a large number and variety of plants establishing themselves in Crownvetched roadsides where adjacent seed trees were present.

Ross and Rodgers reported that based on 1966 figures, Crownvetch seeding cost $213 per acre (exclusive of mulching)—a unit cost, they said, identical for seeding other grass seed mixtures.

Continuing their evaluation, Ross and Rodgers stated:

"The fertility requirements for Crownvetch are about as undemanding as any plant known to the Department. It responds favorably to liming and fertilization, but also does a remarkable job many times when completely neglected. The principal concern then must necessarily be establishment.

"The economics of Crownvetch in design and construction must be fairly obvious to all by now. While flatter highway slopes were always the cry of people dealing with erosion, today that cry is sounded by those dealing with more rigid roadway safety standards. Crownvetch has clearly demonstrated its ability to stabilize slopes 2:1 and steeper.

"This ability has greatly reduced the need for massive slope plantings of shrubs and vines. For example, 300 erosion control shrubs on 5-ft. centers would cover 7,500 sq. ft. at a cost of some $300, while the same areas could be seeded with Crownvetch for about $36 plus a similar amount for mulching.

"All this ties in beautifully," they concluded "with the two most significant considerations before those individuals concerned with roadside maintenance today, namely (1) how to provide the most attractive and effective erosion control measures with minimal maintenance and (2) restore the naturalistic effect as quickly and economically as possible before traffic demands necessitate widening or relocation of the roadway."

OCTOBER:
Big Tree Chippers