UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
BERKELEY, CALIFORNIA

CIRCULAR 336

November, 1934

VETCHES AND RELATED CROPS FOR FORAGE

L. GORDON GOAR¹

Purple vetch.

INTRODUCTION

IN CALIFORNIA, alfalfa is the principal forage crop, a favorite one in sections where it can be grown profitably. In many localities, however, even in the so-called alfalfa-growing areas, the bacterial wilt disease, water shortage during the alfalfa-growing season, and other factors have made this crop no longer profitable. Other large areas are entirely unsuited to the growing of alfalfa because of unfavorable climatic, soil,

¹ Associate in the Experiment Station.

and moisture conditions. The need for forage crops in these areas that are unsuited to alfalfa culture has been great.

In an attempt to satisfy these demands, experiments were started in 1929 in several widely separated communities (fig. 1). Most of these experiments were coöperative between individual farmers, the Agricultural Extension Service and the Agronomy Division of the College

Fig. 1.—Names and locations of towns nearest which the vetch and oats experiments were conducted.

of Agriculture. They were designed to determine crops and varieties adapted to the various soil and climatic conditions, and the yield and analysis of each variety tried. Uniform soil, representative of the dominant type of the several communities, was selected for the plantings. Relatively large plots were laid out for each variety to be tried, and uniform seed was used in each locality. At some of the sites selected for these experiments, irrigation water was available; but at others, only dry-land farming could be practiced. To fill these situations, only crops that would grow during the season of greatest moisture supply and that

could be expected to make satisfactory yields of good-quality feed were considered. These requirements naturally suggested the vetches and related crops, which were used in these experiments.

There are approximately 120 recognized varieties of vetch, less than half of which are annuals. In Europe, vetch is probably the most important annual legume grown for forage; and there its high value for milk production has long been recognized. Field peas are also used extensively in some sections of California, being preferred by many growers. Although numerous varieties of vetch and peas are in use, experimentation has shown that we need be concerned with relatively few, and that common vetch, purple vetch, hairy vetch, and Austrian Winter peas meet the requirements in most sections of this state. It should be clearly borne in mind, however, that no one variety is adapted to all conditions.

Purple vetch succeeds under normal conditions in the interior valleys, and is better adapted to coast conditions than are other varieties. It has succeeded in every test in Marin County near the coast, while other varieties such as common vetch and Austrian Winter peas have been variable and at times have failed almost completely. The experiments indicate that it is the most dependable variety for the coastal region. Common vetch succeeds in the interior valleys and in the foothill sections and is more winter-hardy than purple vetch. Hairy vetch is entirely winter-hardy and succeeds under California temperatures. It is especially adapted to the lighter soils, making satisfactory yields in this respect where other varieties fail. If the crop is to be grown on sandy or other coarse-textured soil, or in sections of low winter temperatures, or on slightly alkaline soil, hairy vetch will give better results than other varieties. Austrian Winter peas, like common vetch, succeed on a variety of soil types provided the drainage is good. They are especially adapted to the interior valleys and to the foothill sections and are more winter-hardy than other varieties of peas.

SEED-BED PREPARATION

The seed bed for vetches should be firm, but well prepared. In dry-land sections, summer-fallowed land should be worked lightly after the first rains in the fall. This procedure destroys the first weed crop and puts the soil in good condition for seeding to vetch immediately. In irrigated sections where rainfall is late, the land should be pre-irrigated about October 1. This arrangement permits disking or spring-tooth harrowing and rolling, floating, or otherwise smoothing the surface in time to plant the vetch by October 15. Normally, in the Sacramento and San Joaquin valleys, on soils of good moisture-holding capacity, the

crop will mature without additional irrigation. When rain ceases early in the season, an irrigation in April is sometimes necessary. On lighter soils in these areas, a total of three to five irrigations is often necessary to produce a good yield. Both in the coastal regions and in the foothill sections, good yields are usually produced with normal rainfall.

TIME, METHOD, AND RATE OF SEEDING

Because the vetches and peas succumb to hot weather and because the natural rainfall should be utilized in supplying moisture, seeding should be done in the fall. In the interior valleys the proper time is October or November. If the crop is to be used for both pasture and hay, the date should be not later than October 20. In the coastal region and in the foothill sections, planting may be delayed with some degree of safety. In Marin and Alameda counties, plantings made in December and as late as January 1 have produced satisfactory yields. In the unirrigated areas the common practice is to delay seeding until after the first rains. If, however, the land has been summer-fallowed, and if weeds are not a menace, the seeding may be done in the "dust." This method has been practiced with success at Ahwahnee during the past two years.

Drilling is the best method of seeding because it distributes the seeds more evenly and places them at a more uniform depth in the soil; the result is better germination and stand. The depth of seeding should vary from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches according to moisture conditions. Peas and hairy vetch may be planted somewhat deeper if necessary. If no grain drill is available, the seed may be broadcast and covered by means of a disk harrow.

The rate of seeding depends upon the variety used. Under favorable conditions, according to these experiments, the planting of 12 vetch seeds per square foot, or 1 seed to each 12 square inches, will result in a satisfactory stand. This is equivalent to 522,720 seeds per acre. In order to adjust the drill easily to this rate, the number of seeds dropped per foot of drill row should correspond to the number of inches between the drill rows. For example, if it is 6 inches between the drill shoes, each shoe should distribute 6 seeds per foot of drill row, or one seed should drop each 2 inches. If it is 8 inches between the disks, then 8 seeds should be dropped per foot in each drill row, or one seed every $1\frac{1}{2}$ inches in each row, and so forth.

Field peas having larger seeds and larger plants than the vetches require more space and fewer seeds. With the larger types of peas, such as Canadian Yellow, 6 seeds per square foot will produce an excellent stand. The more slender viny types, as the Austrian Winter and Tanager pea, may be planted slightly thicker.

Table 1 is useful in determining the number of pounds required to plant the given number of seeds per acre recommended for the several varieties herein discussed.

When grown for hay, silage, or soiling, the vetches and peas are usually mixed with seeds of one of the cereals, and the two are planted together. For this purpose, oats are more commonly used, although rye, wheat, or barley are occasionally preferred by the growers. In these experiments only Kanota oats and common rye have been used. The main

TABLE 1
AVERAGE SIZE OF SEED AND POUNDS REQUIRED TO PLANT ONE ACRE

Variety	Length, millimeters	Width, millimeters	Thickness, millimeters	Number of seeds in one pound	Pounds seed to plant one acre
Common vetch.....	4.812	4.675	3.725	7,100	73.62
Purple vetch.....	4.237	4.675	3.550	9,400	55.61
Hairy vetch.....	3.425	3.425	3.200	16,000	32.67
Monantha vetch.....	4.587	4.462	2.937	10,440	50.07
Calcarata vetch.....	4.075	4.737	3.687	10,180	51.35
Austrian Winter pea.....	5.312	5.187	4.712	4,620	83.00
Canadian Yellow pea.....	6.387	5.975	5.712	2,590	100.91
Tangier pea.....	6.612	4.975	3.500	5,300	76.00

purpose of the cereal is to support the vetch, thus preventing it from becoming wet and slimy near the ground, and to facilitate harvesting. Only general recommendations can be given here regarding the amount of cereal seeds to be used in mixtures for this purpose. On fertile soils of the loamy type where oats tiller or stool heavily, 10 pounds of oats per acre in mixture with vetch or peas is usually sufficient. If the soil be light or if for other reasons the oats tiller but little, then the rate of seeding oats should be increased to 15 or 20 pounds per acre—in some rare cases even to 25 pounds. If rye is substituted for oats in the mixture, from 15 to 25 pounds per acre should be used, according to the soil type and upon the ability of the rye to tiller. If the cereal grain is mixed with the vetch or pea seeds before planting, the mixture should be stirred frequently in the process of drilling, to prevent the lighter seeds (especially the oats) from rising to the top of the seed box, thereby causing an uneven stand. If the aim is to produce hay of the highest possible feeding value, the cereal should be used sparingly in the mixture, only sufficient oats or other cereal being added to support the vetch and prevent it from lodging.

HARVESTING

Vetch is best for hay when cut in full bloom. Oats make good hay if cut when the grain is in the soft-dough stage. When common, purple, or hairy vetch or Austrian Winter peas are used in combination with Kanota oats, the ideal stage of maturity for both the legume and the cereal is reached simultaneously in most sections of California. For this reason, vetch and oats make a very good combination.

Many growers have found vetch difficult to harvest with the ordinary mower and for this reason have discontinued growing it. Most of the difficulties formerly encountered, however, have recently been overcome by the use of several attachments designed for the ordinary mower. These attachments include: outer divider, stub guards, high fender rod, hitch shield, serrated sections, windrower, tongue truck, short cutter bar, and long grass rod.² Two or more of these attachments will be found advantageous in harvesting any crop of vetch. The outer divider and stub guards should always be used. The number and combination of other attachments will depend on the condition of the vetch crop to be harvested.

Vetch leaves dry much faster than the stems. Unless, therefore, the hay is handled rapidly in the field, there is considerable loss of leaves by shattering. Usually one day in the swath is sufficient; then the hay is put in shocks to complete curing.

Several of the vetch varieties, notably hairy, monantha, and calcarata volunteer readily if allowed to mature seed before harvesting. Growers are therefore warned not to allow vetch to mature seed when it is to be followed with a cereal grain crop. There is no danger of its becoming a weed in grain fields, however, if it is harvested before the seed pods become filled.

YIELDS

The yield of vetch and oat hay that one may secure in California depends, of course, on a number of factors. Yields may vary in the different localities from 1 to 5 or more tons per acre. Tables 2 and 3 show yields pertinent to these experiments. Both early and late plantings were made at Davis, the early plantings about October 20 and the late plantings November 20. In the Davis early plantings, the severe cold of

² Bainer, Roy, E. A. Torpen, and J. P. Fairbank. Attachments for mowers to cut vetch. Agr. Engin. Infor. Ser. No. 6. 9 p. (mimeographed.) California Agr. Ext. Service. 1934.

TABLE 2

POUNDS HAY PER ACRE, PRODUCED BY VETCH-AND-OAT AND PEA-AND-OAT MIXTURES,
OBTAINED IN FIVE-YEAR TRIALS

Variety	Yield, 1930	Yield, 1931	Yield, 1932	Yield, 1933	Yield, 1934	Average yield
Davis (early planting)						
Austrian Winter pea and Kanota oats.....		5,839	11,494	8,121	12,406	9,465
Common vetch and Kanota oats.....		4,296	12,396	9,185	10,976	9,213
Hairy vetch and Kanota oats.....		5,357	10,588	10,559	10,377	9,220
Monantha vetch and Kanota oats.....			10,975	8,755	8,365	9,365
Purple vetch and Kanota oats.....		5,626	13,588	8,518	11,315	9,762
Woodypod vetch and Kanota oats.....		5,188				5,188
Davis (late planting)						
Austrian Winter pea and Kanota oats.....		5,284	11,190			8,237
Common vetch and Kanota oats.....		5,061	10,932			7,996
Hairy vetch and Kanota oats.....		5,314	10,612			7,963
Purple vetch and Kanota oats.....		6,429	10,211			8,320
Woodypod vetch and Kanota oats.....		7,333				7,333
Delhi						
Austrian Winter pea and Kanota oats.....		4,753	2,892	1,621		3,088
Common vetch and Kanota oats.....	7,313	4,427	2,578			4,772
Hairy vetch and Kanota oats.....	10,835	6,065	3,973	3,385	3,239	5,495
Purple vetch and Kanota oats.....	7,510	5,688	2,887			5,361
Woodypod vetch and Kanota oats.....	9,518	5,831				7,674
Nicasio						
Austrian Winter pea and Kanota oats.....	8,517		5,507			7,012
Canadian Yellow pea and Kanota oats.....	10,573	7,620	4,169			7,454
Common vetch and Kanota oats.....	6,181	7,366	5,925			6,491
Hairy vetch and Kanota oats.....	7,406	6,524	4,607			6,179
Purple vetch and Kanota oats.....	7,934	6,756	7,602			7,431
Woodypod vetch and Kanota oats.....	6,743	7,150				6,946
Pleasanton						
Austrian Winter pea and Kanota oats.....	10,143	6,263	4,767	4,623		6,449
Canadian Yellow pea and Kanota oats.....		6,834	4,522			5,678
Common vetch and Kanota oats.....	7,814	6,755	6,359	9,098		7,506
Hairy vetch and Kanota oats.....		6,405	5,802			6,103
Purple vetch and Kanota oats.....	8,966	6,848	7,859	7,963		7,909
Tangier pea and Kanota oats.....		5,973	6,712			6,342
Woodypod vetch and Kanota oats.....		6,527				6,527

1932-33 is clearly reflected in the yields of the several varieties. Considerable winter killing was observed in the purple vetch plots, slight damage in the common vetch and Austrian Winter peas, but no damage in the hairy vetch. The average yield of purple vetch was higher than for other varieties in the tests at Nicasio, Marin County, and at Pleasanton, Alameda County; but at Delhi, Merced County, the sandy soil type is plainly reflected in the yield, and hairy vetch easily yielded more than any other variety in the test. These data tend to emphasize the importance of selecting varieties suited both to the soil and to the climatic conditions under which the crop is to be grown.

TABLE 3

POUNDS HAY PER ACRE, PRODUCED BY VETCH-AND-OAT AND PEA-AND-OAT MIXTURES, OBTAINED FROM ONE-YEAR TRIALS

Variety	Ahwah- nee*	Keyes	Marys- ville	Merced	Redding	San Luis Obispo	Visalia
Austrian Winter peas and Kanota oats.....	4,269	7,893	4,706	.....	7,365	.....	7,637
Common vetch and Kanota oats.....	4,294	8,677	5,245	6,613	7,284	8,535	5,239
Hairy vetch and Kanota oats .....	.....	10,175	4,848	5,760	6,023	7,240	5,985
Monantha vetch and Kanota oats.....	4,191	.....	.....	.....	.....	.....	.....
Purple vetch and Kanota oats	5,218	8,470	5,933	5,785	5,522	8,019	6,395
Woollypod vetch and Kanota oats.....	.....	10,403	5,422	4,781	6,895	7,347	5,303

* The yields for Ahwahnee are the average of the 1933 and 1934 crops.

FEEDING VALUE

There are no data in California regarding the feeding value of vetch. Judging, however, from the chemical analysis of numerous samples collected from the several localities where these experiments have been conducted, no legume rates higher in feed value (tables 4 and 5). A number of dairymen in the state, especially in the coastal region, have used vetch and oat hay exclusively for a number of years, and unhesitatingly praise it as feed for dairy cows.

Table 4 shows the average composition of several of the vetches and peas when grown and harvested in mixture with oats, as previously described. Oat, rye, and other cereal hay is much lower in protein than is vetch or pea hay. The higher the percentage of cereal used in the mixture, therefore, the lower the protein content will be. This fact is clearly illustrated by comparing table 4 with table 5, which shows the composition of the legumes and cereals analyzed separately.

DESCRIPTION OF VARIETIES

Common Vetch.—This vetch (*Vicia sativa*), also called Oregon vetch and spring vetch, is probably the best known and most commonly used variety in California. It is adapted to a rather wide range of soil and climatic conditions. It does best on the finer-textured clay and clay-loam

TABLE 4

AVERAGE COMPOSITION OF LEGUMES AND KANOTA OATS GROWN, HARVESTED, AND ANALYZED IN MIXTURE; DAVIS, 1931 AND 1932

Variety	Protein	Ether extract	Crude fiber	Nitrogen-free extract	Ash
	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>
Austrian Winter pea and Kanota oats.....	9.90	4.51	24.90	50.99	9.70
Calcarata vetch and Kanota oats.....	13.81	2.88	32.65	41.38	9.28
Common vetch and Kanota oats.....	11.69	3.08	30.88	44.09	10.26
Hairy vetch and Kanota oats.....	12.74	3.72	28.76	45.01	9.77
Purple vetch and Kanota oats.....	15.56	3.52	28.80	42.01	10.11
Woollypod vetch* and Kanota oats.....	10.20	3.79	28.83	47.22	10.02

* Grown in 1931 only.

TABLE 5

COMPOSITION OF LEGUMES AND CEREALS ANALYZED SEPARATELY AS GROWN AT DAVIS, 1932

Variety	Protein	Ether extract	Crude fiber	Ash	Nitrogen-free extract	Phosphorus	Calcium	Ratio phosphorus to calcium
	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	<i>per cent</i>	
Austrian Winter pea.....	18.93	3.50	24.66	13.61	39.30	0.259	0.600	1:2.317
Canadian Yellow pea.....	16.34	4.78	21.91	5.85	51.12	.259	.688	1:2.656
Common vetch.....	18.67	2.01	27.19	11.50	40.63	.305	.857	1:2.810
Hairy vetch.....	20.93	2.51	21.68	8.87	46.01	.227	.918	1:4.040
Purple vetch.....	20.15	2.61	29.68	10.15	37.41	.311	.838	1:2.695
Kanota oats.....	6.09	3.32	31.56	10.62	48.41	0.168	0.164	1:0.976
Common rye.....	6.14	1.83	33.34	6.68	52.01	.....	.....	.....

soils; but good crops have been grown on the sandy loam and even on somewhat gravelly soils. Whatever the nature of the soil, it must be well drained. Common vetch will withstand temperatures as low as 10° F above zero with little or no injurious effect. Since it quickly succumbs in hot weather, it should be planted in the fall and harvested in the spring.

There are several subspecies of common vetch all varying considerably as to size and color of seed. The most important of these subspecies and the one most commonly used in California has relatively large gray

seeds mottled with a darker color. The plants of this variety grow to a height of 3 to 5 feet or more. The leaflets (fig. 2) have a pinched-off appearance, with the midrib extended. Usually there are seven pairs of leaflets with a terminal tendrils. The violet-purple flowers are borne in

Fig. 2.—Common vetch.

pairs on very short stalks. The stems and leaves are relatively smooth (not hairy). When properly cured, this variety makes hay of good quality.

Common vetch is intermediate in growth during the winter months. In cold weather it makes more growth than hairy vetch, but less than purple vetch. When fall-planted in a mixture with oats, rye, or barley, it affords considerable pasturage in the late winter and early spring. If sufficient moisture is available and the stock is removed in March, a

good hay crop may be harvested, usually in May. Vetch should never be pastured too closely if a hay crop is expected. Calves and sheep apparently do the least damage in pasturing vetch.

Purple Vetch.—This variety (*Vicia atropurpurea*) is adapted to the same soil conditions as common vetch. It succeeds best near the coast, where it produces even larger yields than does common vetch. In addition, it makes considerably more growth during the cool weather of winter than any other standard variety. It is less winter-hardy than common vetch and under average conditions will not survive temperatures lower than 15° F above zero. Like common vetch, it is an annual and should be fall-planted. The stems grow to a length of 3 to 6 feet or more. The leaf has seven to nine pairs of leaflets, long, oval, and terminated by a tendril. The leaflets and, to a lesser extent, the stems are covered with numerous fine hairs, which give the plant as a whole a silvery-grayish appearance. Unlike common vetch, the flowers of this variety are borne in showy clusters of twenty or more purple flowers, which hang more or less to one side of the flower stem (see frontispiece). The seeds are a solid, velvety black, with a conspicuous raised white scar at the point where they were attached to the pod. They are somewhat smaller than common vetch seeds and are fairly uniform in shape and size. Purple vetch is readily eaten by livestock, both when used as a pasture plant and when cured into hay; its feeding value is high.

Hairy Vetch.—The vetch, *Vicia villosa*, has several common names—sand vetch, winter vetch, Russian vetch, Siberian vetch, or hairy vetch. In several respects it differs from the common and purple varieties. It is annual in habit of growth when fall-planted. Although especially adapted to sandy and sandy-loam soils, it succeeds on most soil types, provided the land is well drained. Being more winter-hardy than other varieties, it is seldom, if ever, winter-killed in California. It is more drought resistant and more alkali-tolerant than other varieties, often yielding well under adverse conditions where other vetches fail. During the cool winter months, it makes very little vegetative growth, but its tremendous root development during this period accounts for its resistance to drought. The limited early top growth, however, makes it of little value for winter pasture. The plants grow very rapidly in the spring, the stems frequently attaining a length of 12 feet. Because of its viny nature, it seldom attains a height of more than 3 or 4 feet unless grown with oats or some other supporting crop. From 9 to 17 pairs of narrow leaflets constitute the leaf, which is terminated by a tendril. Twenty to thirty blue-violet flowers are borne on one side of a long flower stem (fig. 3). The stems and leaves are characterized by many relatively long hairs. The seeds, small, spherical, and nearly black, are very irregular

in size. This variety would, no doubt, be more generally used were the seed not comparatively high-priced.

Smooth Vetch.—Smooth vetch (*Vicia villosa*), though not used in these experiments, has certain commendable characteristics. In adapta-

Fig. 3.—Hairy vetch.

tion to soil and moisture conditions, and in general habit of growth, it is almost identical with hairy vetch. The seeds of these two varieties are indistinguishable, and much imported seed of smooth vetch has been sold under the name hairy vetch. Smooth vetch is winter-hardy, but not to the same extent as hairy vetch. The plants of the smooth variety have

Fig. 4.—*Monantha* vetch.

fewer hairs on the leaves and stems, and smaller flowers of a more reddish-purple color. Under average California conditions this smooth variety is probably equal in value to hairy vetch.

Woollypod Vetch.—Among the vetches having the same requirements and adaptability as hairy vetch, is woollypod vetch (*Vicia dasycarpa*). It has no special advantages over the former except that under favorable conditions it matures a few days earlier. The leaves and stems are slightly hairy; and the purple flowers are borne in clusters on long, one-sided flower stems. The seeds are usually slightly larger than those of hairy or smooth vetch, and are oval instead of round. Because the seed is exceedingly scarce, the price is high. Growers are not justified, however, in paying more for it than for hairy vetch.

Monantha Vetch.—One of the very early-maturing varieties is monantha vetch (*Vicia monantha*). Soil, moisture, and date of planting being the same, it will have fully developed seed pods by the time the previously described varieties are in bloom. It grows well during the cool weather, but is less winter-hardy than other standard varieties except, perhaps, purple vetch. It may be used to advantage as a late-winter or early-spring pasture crop. It matures too early to be used in combination with the cereals, and is the most difficult of the vetches to harvest for hay. It is a heavy seed producer and, when pastured after the seed pods are well filled, affords feed of high protein content. Having many small, weak stems, it does not ascend without support. The leaf is made up of seven or more pairs of very narrow, blunt-tipped leaflets and is terminated by a tendril. Single pale-blue flowers are borne on long stems (fig. 4). The seeds, somewhat smaller than those of common vetch, are lens-shaped, almost circular, and decidedly flattened. The ground color is buff with irregular darker markings. This variety is adapted to most soil types provided they are well drained.

Calcarata Vetch.—This vetch (*Vicia calcarata*), sometimes also called Bard vetch, is another rapid-growing, early-maturing variety. Although adapted to a wide range of soil types, it does not succeed on sandy soils. It also develops too rapidly to be grown in combination with oats or other cereals for hay, but may be used as a pasture crop. In sections where moisture is available, it may be planted in August or September and pastured in November or December. In the Imperial Valley, it makes excellent growth as a winter crop, but in other parts of the state the growth is often short and unsatisfactory when late plantings are made. Like monantha vetch, calcarata is a heavy seed producer; the pods do not split lengthwise and spill the seeds as do most other varieties. Very little seed is available, but the amount could be quickly increased if a demand should arise. This variety has rather narrow leaf-

lets, seven or more pairs, and a tendril constituting a leaf. The stems and leaves are smooth, with a grayish cast. The bluish flowers, larger than in *monantha*, are usually borne in pairs on a long flower stalk (fig. 5). The seeds are about the same size as *monantha* seeds, but irregu-

Fig. 5.—Calcarata vetch.

lar in shape. Their width and length are almost the same; but they are less flattened and are often indented. The color is brown, with darker specks and markings; a distinctive dark stripe runs down the back. The seed scar at the point of attachment is white and raised.

Austrian Winter Pea.—The Austrian Winter pea (*Pisum arvense*) prefers loams and clay loam soils, but will succeed on most soil types if

well drained. This variety is more winter-hardy than other field peas and is adapted to the conditions described for common vetch. Being a very viny type, with small, weak stems, it will not ascend without a

Fig. 6.—Austrian winter pea.

supporting crop, such as oats or rye. Like most other winter-hardy annuals, it grows very little during the cool winter months, but rapidly in the warmer spring weather. These peas make hay of very good quality, but, having larger and more succulent stems than the vetches, are somewhat more difficult to cure. This variety should be fall-planted and spring-harvested, as it quickly succumbs under high temperatures. The

flowers, rose to lavender in color, are borne singly or in pairs on long stems. Usually two leaflets and a tendril constitute the leaf (fig. 6). The seeds are considerably larger than in common vetch and are almost

Fig. 7.—Tangier pea.

spherical. They are pale green to brown, covered with numerous specks of a darker coloring. The black seed scar is relatively small. For hay production under California conditions, the Austrian Winter field pea is by far the most promising variety of peas.

Canadian Yellow Pea.—Another variety of *Pisum arvense* is the Canadian Yellow pea. It is adapted to the same soil and climatic conditions

as described for common vetch and the Austrian Winter pea, except that it is less winter-hardy than the latter variety. Under California conditions, however, they may be safely planted in the fall. They make more growth during the fall and winter months and mature earlier in the spring than the Austrian Winter pea. The short, thick stems and abundance of early-maturing seed pods make this variety difficult to cure for hay. These peas are an excellent spring pasture crop, however, especially for pasturing to hogs. Three pairs of leaflets and a tendrill make up the leaf. The white flowers are borne in pairs and threes on relatively long stems. The buff or cream-colored seeds are almost round and are considerably larger than Austrian Winter pea seeds.

The Tangier Pea.—An annual legume of much the same character of growth as the Austrian Winter pea is the Tangier pea (*Lathyrus tingitanus*). In appearance it is similar to the garden sweet pea, having winged stems, relatively narrow leaflets, and showy pinkish lavender flowers, borne usually in pairs but sometimes in threes on long stalks. The leaves are short, having but two leaflets and a branched tendrill (fig. 7). The brown seeds are slightly flattened, having inconspicuous darker markings. The white seed scar is long and narrow. The Tangier pea is adapted to most soil and climatic conditions in California and has made satisfactory yields in a number of trial plantings. It makes palatable and nutritious hay; but because of the scarcity and high price of the seed, it has been used but little commercially.