

UNIVERSITY OF CALIFORNIA PUBLICATIONS.

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UNIVERSITY OF CALIFORNIA—COLLEGE OF AGRICULTURE.

AGRICULTURAL EXPERIMENT STATION.

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REPORT OF WORK

OF THE

AGRICULTURAL EXPERIMENT STATION

OF THE

UNIVERSITY OF CALIFORNIA

FOR THE YEARS 1898-1901.

PART I.

BEING A PART OF THE REPORT OF THE REGENTS OF THE UNIVERSITY.

*per reports of Sub-st. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.*



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Some orange and lemon trees have been planted on the most sheltered spot that can be found.

The fig collection has been considerably increased, especially by all the Roeding varieties of Capri or wild figs.

The olives have borne large crops and have attracted much attention in the district, so much so that a separate bulletin on the olive in the Sierra foothills would seem desirable. After years of experience at the four substations in the counties of Amador, Tulare, San Luis Obispo, and Los Angeles, as well as at the Central station at Berkeley, no collection of olive trees planted by the station promises so much profit as does this one. Even here the first-rate varieties which can be generally recommended to growers are few. The best all-around variety at the substation is the Manzanillo, with the Mission a good second. The most profitable oil varieties are Uvaria and Atroviolacea. These four varieties do fairly well with care on the granitic soil, when it is deep, but they do better on the slate soil.

Grapes are being planted in the foothills more and more each year, so that the value of the large experiment here is very plain. After long experience, the substation recommends for dry red wines, Aramon (short pruning), Carignane (short), Mataro (short), and Tinta Val de Pefias (half-long). For dry white wine, Burger (short), Semillon (long), Sauvignon (short). For sweet wines, Palomino (short or half-long), Boal de Madeira (half-long), West's Prolific (short), Tinta Amarella (half-long). For table use, white, Luglienga, Chasselas de Fontainebleau, Muscatel, Palomino, Muscat of Alexandria, White Tokay, Verdal, Almeria; red, Barbarossa, Flame Tokay, Zabalkanski; black, Cinsaut, Aramon, California Malvoisie, Tinta Amarella, Black Muscatel, Black Morocco, and Emperor.

#### THE SOUTHERN COAST RANGE CULTURE SUBSTATION.

The substation near Paso Robles has cost more in proportion to positive results than any other station. It was located on soils typical and varied, east of the Salinas, in a region which in 1888 was just changing from pastoral to agricultural conditions. All the newcomers, unused to the peculiar problems of soil and climate here, wasted large sums of money on unsuitable crops. The substation necessarily did the same, keeping record of results, so that in many cases these must now be recognized as final.

When the substation was established, the people of the whole upper Salinas region were planting vines and trees. The country was said by some to be semi-tropical and to be adapted to olives, figs, oranges, and lemons. Its adaptation to all the ordinary deciduous fruits of the Bay counties was generally believed to be excellent. In order to test this fully, the substation planted large collections of trees and vines on different soils, gave them the best of care and culture, and has arrived at conclusive results, which will be printed *in extenso* in a forthcoming bulletin (No. 141). Experiments with cereals, grasses, and forage plants have been continuous, and a large variety of small cultures has been thoroughly tested on different soils.

The "hardpan," both physical and calcareous, has received especial

attention, and moisture determinations have been made in different seasons upon soils occupied by various crops and different kinds of trees. Fertilizer experiments have also been carried on, particularly on the light granitic soils.

*Changes in Substation Management.*—In July, 1901, Mr. S. D. Merk of Paso Robles was appointed patron in place of Mr. F. D. Frost, and Mr. Neal became foreman in place of Mr. J. H. Barber, transferred to Amador County. In February, 1902, Mr. Neal resigned, having been appointed to U. S. station work in Alaska, and Mr. John Ooley, who has before been workman in charge at this substation, took his place. The regular running expenses have been greatly reduced by the removal of nearly all the older parts of the orchard and half the vineyard (all on poorer soils), and the bringing of a number of experiments to conclusion.

*Climate.*—A careful comparison of the rainfall records kept at the substation and at the adjacent town of Paso Robles shows that while the average yearly rainfall for the four years after and including 1887–88 was over twenty-one inches, the average for the next four seasons from 1897–98 has been less than thirteen inches. The average of fifteen successive seasons was sixteen inches.

The records show that the first crop has been more or less injured by late spring frosts in nine out of thirteen years. There have been as many as fifteen killing frosts in March and April. One year there were forty-two such frosts between September and May. The warm, bright days of February “bring out” fruit blossoms astonishingly, and no method which science or experience could suggest has been able to retard the development of this blossoming. In this country of rolling hills, strong wind currents, and low winter temperature over a large area, no smudging in the orchard is effective.

*Results of Orchard Experiments.*—The detailed results of work with deciduous fruits here, and over a large area east of the Salinas River, will be given in a forthcoming bulletin; but briefly stated, the “hardpan” soils, both calcareous and physical, east of the river, are totally unsuited for fruit culture, although, when young, grapevines thrive, and, if the blossoms are not frosted, peaches and nectarines bear fairly well. At their best, orchards on such soils yield only small crops of low-grade fruit, suitable for family use, but not profitable. The native oaks do well on hardpan, as the roots penetrate to a considerable depth; but fruit trees are not as well able to do this. On the heavier and deeper soils, such as the brown and black adobes, pears and apples often do very well, and, unless the location is subject to late frosts, the stone fruits, excepting cherries and European plums, are fairly successful. On such soils some excellent vineyards have been established.

The young orchard, planted in 1897 on black and brown adobe soils, as well as an old orchard planted at various times since 1889 on swale soil and brown adobe, possess at present an especial value for the district. Taken together, they constitute the most thrifty orchard of apples and pears known to us on the east side of the Salinas River, over an area of more than three hundred square miles. The young

orchard on the black adobe is altogether the best, and is just beginning to bear fruit. A number of apples new to this district, and generally new to California, fruited for the first time in 1901. The apple season here has been extended by one new California seedling, Gold Ridge Winter, a large and excellent fruit which kept until late in December. As such varieties as Yellow Newtown Pippin have not kept later than November 1st (as grown at the substation), the value of this introduction is considerable.

*Experiments with Seeds from the U. S. Department of Agriculture.*—Here, as at the other stations, a large number of cultures during the past three years have been devoted to plants the seeds of which were sent out by the Division of Seed and Plant Introduction. The location is so poorly adapted to general cultures that only about a quarter as many different sorts were tested here as at Amador, and nothing made a great success excepting some of the cereals, the new saltbushes, the watermelons, and a few lupins on the adobe soil. The muskmelons and squashes failed; the Turkestan alfalfa required irrigation; Jersey kale, March rape, and Russian sunflowers, planted with the first rains, did very well until the summer heats came. Hairy vetch, sown with rye, yielded very well, but no other vetch succeeded here. In some seasons lentils have yielded good crops; in others, they failed utterly.

Vegetable gardens, started very early and planted to only the most hardy species, grow fast during the winter and spring, and the crops are of high quality. But the vegetables which mature slowly require irrigation, and some need shelter from severe late frosts and hot sun.

In years of ordinary rainfall the growth of cereal plots is excellent and rapid on all soils, no finer grains having been produced at any of the substations than the wheats, barleys, oats, ryes, and spelts grown here in great variety three years out of four since 1889. The gluten wheats sent out by the U. S. Department of Agriculture have done remarkably well here.

*Fertilizer Experiments.*—On adobe soil of good quality, the application of nitrate of soda only increased the yield of hay from 2,200 pounds to 3,340 pounds per acre, but the weight of grain was raised from six and a quarter centals to thirteen and three quarters centals per acre. Estimated in money, the application of \$3.60 worth of nitrate added \$5.50 worth of hay, or \$7 worth of grain to the crop per acre.

When drilled on light soil (granitic underlaid by hardpan) several late frosts checked the growth, and all gains were lost. In another experiment on light soils, with broadcast plots, the amount of the crop was increased forty per cent, the profit being rather more than was the case with the heavy soil.

Fertilizers applied to vineyard and orchard showed good results in growth of trees, but thus rendered them more susceptible to frosts, excepting in the case of the hardier apples and pears in the young orchard, where the gains were distinctly noticeable. As the trees were not yet of bearing age, this was merely fertilizing for future results.

*Lupins for Green-Manuring.*—The experiments made here with European lupins have been quite satisfactory, both on the granitic soils on hardpan and on the better soils in the young orchard. Some seasons

early frosts prevent the lupins from making a start. But if sown early, they become rooted before the severe frosts, grow fast and then can be plowed-under in spring. In such seasons the first blossoming is about the end of January, and the second, or side-shoot blossoming, is from March 10th to March 15th. The large European lupin has been much the best species here. Its growth on the light soil has been from eighteen inches to two feet high, well branched; and on the heavy soil, about fifteen inches and less branched. This smaller size on the better soil is due to its later starting in the early winter.

*Success with Saltbushes.*—One of the things done by this substation, the introduction of Australian and South American saltbushes, for dry-land forage plants, is of extreme economic importance to the people of a district in the Coast Range larger than the State of Connecticut. The first valuable introduction was the well-known *Atriplex semibaccata*. During the season of 1897-98, when the total rainfall was but a little more than four inches and all the other field crops failed, this plant grew all summer, yielding at the rate of one and a half tons of dry forage, or coarse hay, per acre, and five hundred pounds of seed, also of high food value. This showing was so remarkable that it was difficult to believe such results, but the experience of three subsequent seasons confirmed them in every particular.

Saltbush seed was distributed throughout the entire district, to every farmer who would agree to test it. More than two hundred persons sowed seed, and in every case made a success of the crop. Its value was greatest on the light and hardpan soils, as reports from all parts of the county, particularly on the east side of the Salinas, clearly showed. The area devoted to saltbush is steadily increasing. The plant shows some ability to naturalize itself in pastures and by roadsides, but the well-known "fox-tail" chokes it out, as it also does the wild oats, clovers, and other native forage plants. Saltbush, however, can hold its own with our native weeds. In 1900, at the substation, saltbush under ordinary field culture yielded at the rate of three and a half tons of dry fodder per acre. One special advantage of the crop for this district is that, if cut back or fed off about the middle of October, it makes six or eight inches of new growth by the middle of January, long before our native forage plants in this region on similar soils are fit for pasturage.

During the past three years, another saltbush, *Atriplex nummularia*, (Plate 18) has come into deserved prominence at this substation. This species grows tall and is considered one of the most valuable of all in Aus-



PLATE 18. ATRIPLEX  
NUMMULARIA.

tralia, where it is extensively propagated from cuttings. It is a browsing plant chiefly and does not furnish hay such as that of *A. semibaccata*. But its drought-resistance is enormous, and it is probable that if widely planted, its value on cattle ranges here would equal or surpass that of the latter. Cut once, December 11, 1901, the plants, then two years old, yielded at the rate of over seventeen tons of excellent green forage per acre. Two cuttings are practicable here, giving a total of from twenty to twenty-five tons of green feed for sheep or cattle. *A. nummularia* here is far superior to *A. halimoides*, *A. vesicaria*, and the other tall Australian species tested. Fifty plants, a year old, will furnish cuttings sufficient to plant an acre of ground. The cuttings, of old wood, made six or eight inches long, should be rooted in boxes of sand, from which they can be transplanted in rows four feet apart, if on poor soil; on rich soil they need more space.

*Atriplex pamparum* and *A. cachiuyum*\* are two tall-growing species of saltbushes, new to North America, and natives of Argentina. They have shown much endurance of droughts and frosts, and produce a large amount of excellent forage on extremely poor soils. As far as tested, they yield somewhat less than *A. nummularia*; but further experience may show them to be more valuable than that species. The plants have not yet seeded here.

Two rhagodias, *R. spinescens inermis* and *R. linifolia*, have shown great forage value at this substation, and also great endurance of drought and frost, besides containing less salt in their leaves, so that horses, which do not always like the atriplexes, are more fond of the rhagodias. These plants promise more value in the Paso Robles region than at Tulare, where, while growing well, the yield is not proportionately as profitable. This is especially so in the case of *R. linifolia*, which makes a larger plant in the Coast Range on poor soils, than at the Tulare substation on alkali land.

At present, the only plantations of saltbushes existing in the region outside the substation consist of *Atriplex semibaccata*. The largest of these is fifteen acres in extent, near Cholame, but there are many of one acre and upward. The rhagodias and the tall saltbushes herein recommended can very easily be naturalized over a wide area, and with the prostrate *A. semibaccata* will not only enable farmers to carry their livestock through dry seasons, but will afford more dry-land forage per acre than any other plants tested at the substation.

#### SAN JOAQUIN VALLEY CULTURE SUBSTATION.

The results of work of the past three years at the Tulare substation have to some extent appeared in several publications, such as Bulletin No. 133. Several large charts showing the history of the region in relation to alkali have been prepared, but, with the data relating to them, await fuller publication. No changes have occurred among the local officers of the substation.

*Improvements.*—A new well has been sunk in the northeastern five acres of the twenty-acre tract, and a good pump placed therein. Water for the necessary irrigation in dry years and for continued reclamation of alkali spots is raised by horse-power. The well on the south side

\*There two species are now stated to be identical.