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Buletin ilmiah *Plasma Nutfah* diterbitkan oleh Badan Penelitian dan Pengembangan Pertanian secara berkala, dua kali setahun, memuat tulisan hasil penelitian dan tinjauan ilmiah tentang eksplorasi, konservasi, karakterisasi, evaluasi, dan utilisasi plasma nutfah tanaman, ternak, ikan, dan mikroba yang belum pernah dipublikasi di media lain.

Daftar Isi

Gambar sampul:
Jambu mete ***Anacardium occidentale* L.**

Badan Penelitian dan Pengembangan Pertanian
Departemen Pertanian

Flowering, Botanical Seed Production, and Growth Status of Sweetpotato Germplasm at Two Different Agroclimatic Conditions

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ABSTRAK

Informasi kemampuan berbunga dan produksi benih botanis plasma nutfah ubi jalar di Indonesia masih terbatas. Tujuan penelitian ini adalah untuk mengevaluasi kemampuan berbunga dan menghasilkan benih botanis beberapa aksesi ubi jalar pada dua kondisi klimatik berbeda. Percobaan lapang dilakukan di Cikeumeuh, Bogor (220 m di atas permukaan laut) dan Pacet, Cianjur (1100 m dpl) mulai Maret 1996 sampai Oktober 1996. Sebanyak 109 aksesi ubi jalar tahan penyakit kudis ditanam di Cikeumeuh, sedangkan 74 aksesi yang mempunyai bahan kering tinggi ditanam di Pacet. Dari kedua penelitian tersebut diketahui bahwa awal pembungaan dan puncak musim pembungaan di Cikeumeuh lebih cepat dibandingkan dengan di Pacet. Namun demikian, masa pembungaan aksesi ubi jalar di Pacet jauh lebih lama dibanding di Cikeumeuh, sehingga produksi kapsul dan benih botanis yang dihasilkan di Pacet jauh lebih besar dibanding di Cikeumeuh. Sekitar 9% dari semua aksesi yang diuji di Cikeumeuh mampu menghasilkan benih botanis lebih dari 100 buah per tanaman dan sekitar 29% aksesi gagal menghasilkan benih. Di Pacet, lebih dari 59% aksesi yang diuji mampu menghasilkan benih botanis lebih dari 100 biji per tanaman dan hanya 1% yang gagal menghasilkan benih. Jumlah maksimum benih botanis yang dihasilkan di Pacet dan Cikeumeuh berturut-turut adalah 1392 dan 401 buah. Rata-rata bobot brangkasan aksesi yang ditanam di Cikeumeuh lebih banyak dibanding di Pacet, Sebaliknya, rata-rata jumlah umbi, bobot umbi, dan indeks panen di Pacet lebih tinggi dibanding di Cikeumeuh.

Kata kunci: *Ipomoea batatas* L., agroklimat, pertumbuhan, pembungaan, benih botanis.

ABSTRACT

Information of flowering ability and botanical seed production of Indonesian sweetpotato germplasm is very limited. The objective of this trial is to evaluate the flowering ability and botanical seed productivity of sweetpotato accessions under the two different agroclimatic conditions. Two field trials were conducted at Cikeumeuh Research Experimental Station with 220 m above sea level (ASL) and Pacet Research Experimental Station with 1100 m ASL from March to October 1996. About 109 accessions which are characterized by resistant to scab disease were cultivated at Cikeumeuh Research Experimental Station, while 74 accessions of sweetpotato which were characterized by high dry matter were cultivated at Pacet Research Installation. From those trials it was found that the flowering date and peak season of sweetpotato accessions cultivated in Cikeumeuh were earlier than that of Pacet. The flowering period of sweetpotato in Pacet was longer than that of Cikeumeuh. Accordingly, the number of capsule and seed produced at Pacet was significantly higher than that of Cikeumeuh. It was considered that about 9% of accessions at Cikeumeuh were able to produce more than 100 seeds per plants, and about 29% failed to produce flower and seed. While at Pacet, the number of seed per plant produced by accessions was high up to 59%, and only 1% were not able to produce flower and seed. The maximum number of seed obtained at Pacet was higher than that of Cikeumeuh, 1392 and 401 seeds per plant, respectively. The average of vine weight of the sweetpotato accessions cultivated at Cikeumeuh were higher than those at Pacet. On the contratry, root number, root weight, and harvest index of the accessions cultivated at Pacet was higher than at Cikeumeuh.

Key words: *Ipomoea batatas* L., agroclimatic, growth, flowering, botanical seed.

INTRODUCTION

Sweetpotato is an important food crop in Indonesia. Most of the people in the highland of Irian Jaya (Papua) consume sweetpotato as a staple food. While in Java and other islands of Indonesia sweetpotato used as a snack and industrial source material.

It was stated that sweetpotato originated from Central America (Onwueme, 1978). However, Indonesia is also recognized as a center of genetic diversity in the world. It was reported that 935 accessions has been collected from various regions of Indonesia (Tabel 1).

Table 1. Sweetpotato germplasm collected as *ex situ* conservation at Bogor, 1998

Origin of germplasm collected	Accession number
Java	210
Sumatera	153
Sulawesi	41
Bali and Nusa Tenggara	96
Irian Jaya	435
Total	935

Source: Mok *et al.* (1998).

Several Indonesian Research Institutes and Universities collaborate with International Potato Center regional East and South East Asia and Pacific (CIP-ESEAP) involved in the exploration and conservation of sweetpotato germplasm.

Ability of plant to produce flower are affected by internal (genetic) and external factors especially photoperiodism (Taiz and Zeiger, 1991). Furthermore, it was reported that flowering ability of sweet potato vary among accessions. It was reported that there are three categories of flowering ability in the natural day length. Firstly, profuse or good flowering; Secondly, moderate flowering; and thirdly, no flowering. From all sweetpotato germplasm collected about 13, 42, and 45% of the accessions were classified to each category, respectively.

Conservation of these accessions as an active collection in the field requires extremely high input for long period. Alternatively, botanical seed can be obtained and stored as a base collection. Reasonable number of clones will be maintained clonally for the regional breeding program as working collection. Furthermore, the seeds obtained can be stored for long term conservation using low temperature conservation.

Based on different groups of breeding parent material characteristics, more than 374.000 botanical seed of sweetpotato have been collected (Djazuli, 1999). The seeds collected have been conserved at CIP-ESEAP, Bogor and RIFCB as a source material for selection and seed technological trials.

Stored seed can be used in the future for breeding material, and genetics study. These seeds hopefully can be used as an important source of gene(s) for genetic manipulation in the future. The seed population will represent the genetic diversity of sweetpotato in Indonesia which has been known as the secondary center of genetic diversity.

The objective of this trial is to find out botanical seed from Indonesian sweetpotato germplasm which are characterized by high dry matter content and high resistant to scab disease and to evaluate growth status, flowering ability of sweetpotato accessions under the two different agroclimatic conditions.

MATERIAL AND METHODS

Two field trials were conducted at Cikeumeuh Experimental Station with 220 m above sea level (asl.) and Pacet Experimental Station with 1100 m asl. from March to October 1996.

About 109 accessions characterized by resistant to scab disease were cultivated at Cikeumeuh Experimental Station, while 74 accessions of sweetpotato characterized by high dry matter were cultivated at Pacet Experimental Station.

Ten top cuttings from each accession were planted in the fields at Cikeumeuh and Pacet. Open-pollinated crossing blocks were set up with stakes to induce flowering and to facilitate insect pollination. Planting were conducted at the last week of February to use the natural short day condition. Plant spacing were 25 x 100 cm.

Observation were focused on flowering starting period, number of flower, number of capsule, number of seed, and plant growth status. Seed collecting were conducted at 30-35 days after flowering. Capsule or seed were collected twice a week or depend on the number of capsule condition from May to September 1996. All seeds collected

were kept in the cold storage. The conservation is conducting at CIP-ESEAP and RIFCB, Bogor.

RESULTS AND DISCUSSION

Growth Status

Almost all accessions cultivated were able to grow well both at Cikeumeuh as a lowland (220 m usl) and Pacet as highland (1200 m asl) climatic conditions (Tables 2 and 3). It is considered that sweetpotato well adapted to tropical and sub-tropical climatic conditions.

Growth status of the vegetative part or vine weight were vary among accessions, however, the average of vine weight of accessions planted at Cikeumeuh was 661.9 g/pl and it was slightly higher than at Pacet (468.6 g/pl). It is considered that the vegetative growth of sweetpotato is strongly affected by soil humidity.

Based on the data on rainfall have been collected for over than 20 years, it was reported that mean rainfall per month at Cikeumeuh, Bogor, is higher than that at Pacet (Oldeman, 1975). Furthermore, he stated that Bogor is classified as A zone (has more than nine consecutive wet months) and Pacet is classified as C zone (has 7-9 consecutive wet months).

Flowering Ability

Generally, the beginning of flowering period of sweetpotato accessions cultivated in lowland of Cikeumeuh was earlier than those in highland of Pacet. It was considered that low temperature at Pacet inhibited the chemical metabolism in plant, including flowering.

Furthermore, Taiz and Zeiger (1991) stated that plant flower at different ages, indicating that the age of the plant is one of the internal factor controlling the switch from vegetative to reproductive development. On the contrary, the plant growth and flowering period of sweetpotato cultivars in Pacet was longer than those at Cikeumeuh (Figure 1). The peak season of flowering at Cikeumeuh was found at 19 weeks after planting (WAP), while those at Pacet was obtained at 24 WAP.

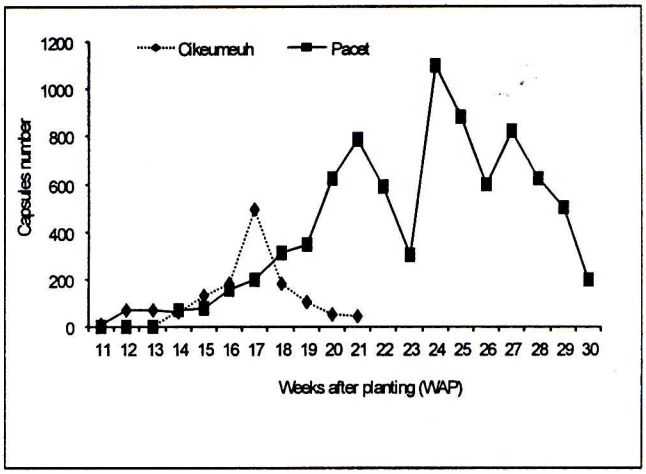

Figure 1. The effect of two different agroclimatic condition on flower/capsule production of sweetpotato germplasm.

Capsule and Seed Production

The flowering period of sweetpotato cultivated at Pacet promoted the average number of capsule and seed significantly higher compared to capsules and seeds produced by sweetpotato at Cikeumeuh (Tables 2 and 3).

The number of accessions which able to produce flower and seed in Pacet were slightly higher than the accessions cultivated at Cikeumeuh. Furthermore, it was observed that the accession number which able to produce seeds in Pacet which were able to promote seeds 73 accessions or 99%. While those of accessions planted at Cikeumeuh were 71 accessions or 65% from the total accessions tested. Therefore, it could be considered that the microclimatic condition in Pacet is more suitable for producing botanical seeds than that of Cikeumeuh.

The number of capsule and seed produced by plant was vary among accessions At Cikeumeuh field station, it was found that only 9% of accessions were able to produce high seeds more than 100 seeds each plant. While at Pacet, 43 accessions or 59% was able to produce more than 100 seeds each plants. From those observation it could be concluded that the productivity of sweetpotato germplasm for producing seed at Pacet was much higher than that at Cikeumeuh.

Table 2. Capsules, seed number, and growth status of some sweetpotato germplasm planted at Cikeumeuh, 1996.

No	Accessions	Total cap-sule/plant	Total seed /plant	No of root /plant	Vine weight (g/plant)	Root weight (g/plant)	Harvest index (%)
1	Unknown	15	46.6	1.7	640	600	48
2	BIS 175	79.6	263	2.1	570	640	53
3	BIS183	5.3	22.2	2.4	1130	540	32
4	BIS173	11.4	28.6	2.3	760	400	34
5	BIS174	0	0	3.2	440	800	65
6	NO 25	9.2	23	0.7	720	40	5
7	NO 5	2.1	5.6	0.8	800	60	7
8	SQ27	3.3	6.2	0.1	790	210	21
9	Rambo	0	0	1.5	740	370	33
10	Bulhok	1.9	5	3.9	420	660	61
11	Unknown	7.1	19.4	1.2	620	390	39
12	Unknown	36.5	83.8	1.4	240	160	40
13	Unknown	2.4	7.6	0.6	820	25	3
14	Unknown	12	32.4	0	680	0	0
15	Unknown	27.6	65.4	0	850	0	0
16	Manggu2	3	7.4	1.1	640	110	15
17	Unknown	19.4	58	0.6	520	90	15
18	Unknown	0	0	0.9	680	220	24
19	Unknown	2.3	6.8	1.3	620	200	24
20	Unknown	0	0	3	600	950	61
21	Unknown	9.8	26	3	450	660	59
22	BIS183(OP)-SR	30	80.4	2	320	100	24
23	Ubi Bogor Merah	76.9	259.8	1.4	580	210	27
24	Lanbau	121.5	400.6	2.2	660	900	58
25	Jurai	15.5	59.2	2	560	260	32
26	Bogor	8.1	19.4	0	620	0	0
27	Pela jantan	11.7	28.8	0	740	0	0
28	Magelang B	0	0	0	810	0	0
29	Sioribo A	0	0	2.4	710	590	45
30	Chrch A	12.7	36	1.4	900	640	42
31	Curch B	76.3	201.8	2.2	720	1000	58
32	Unknown	25.1	63.8	2.6	590	770	57
33	Anggi	0	0	0	200	0	0
34	Mandau	21.1	55.6	1.2	700	540	44
35	Marita	0	0	0.3	620	20	3
36	Morotai	3.3	8.4	2.5	800	500	38
37	Prambanan	46.2	146.4	5.6	700	860	55
38	Prambanan 1	90.9	370.2	4.2	500	970	66
39	Ciceh 32	10.5	33.2	1.6	570	330	37
40	Lapis 30	25.6	88.6	1.9	300	640	68
41	TIS 5125/59	75.7	284	1.2	480	500	51
42	Taiwan 395/6	0	0	1.5	200	700	78
43	Unknown	2.8	12	3.1	920	620	40
44	Unknown	0	0	0.9	1490	70	5
45	Unknown	77.4	280.2	1.5	1300	490	27
46	Unknown	10.7	28.6	0.3	520	50	9
47	Unknown	17.4	49.8	1.1	310	51	14
48	Unknown	9.5	21.8	3.4	720	1140	14
49	Unknown	0	0	2.3	560	720	67
50	Unknown	6.7	14.4	2.7	470	310	61
51	Unknown	46.6	101	2.5	510	450	38
52	Unknown	24.3	70.2	1.8	650	460	41
53	Hawara Bodas	0	34.2	2.4	550	300	46
54	Manggu2	0	14.6	0.6	560	360	35
55	Paris	0	0	1.9	480	570	43

Table 2. Continued

No	Accessions	Total capsule/plant	Total seed/plant	No. of root /plant	Vine weight (g/plant)	Root weight (g/plant)	Harvest index (%)
56	Wortel 4	9	21.9	3.9	940	570	38
57	Muntul	51.9	209.9	3.6	670	420	39
58	Jonggol	0	4.5	0.9	440	100	19
59	Aug Mobatkej	2.4	28.4	0	340	0	0
60	Aug Jogohu	0	0	0	1020	0	0
61	Aug Guahan	0	1.9	0.2	500	23	4
62	Bekau Genenai	0	0	0.1	960	20	2
63	Bekau Kuhob	0	0	0	320	0	0
64	Bekau Nenei	0	0	0	550	0	0
65	Bekau Bob	3.3	6.4	0	700	0	0
66	Bekau Ngoi	0	0	0	720	0	0
67	Bekau Jeb	2.2	11	0.2	900	500	36
68	Aug Kortrogo	8.7	29.6	0	890	0	0
69	Aug Moguagat	0	0	0	540	0	0
70	Unknown	0	1.2	0	660	0	0
71	Alhamdulillah	12.4	23.3	0	500	0	0
72	Kue	0	0	0.2	1020	48	4
73	Kangkung	0	7.9	0	800	0	0
74	Unknown	9.3	17.3	0.5	530	50	9
75	Unknown	1.3	2.6	2.6	660	500	43
76	Gowi adule	9.6	29.9	1.9	410	420	51
77	Unknown	25.3	44.3	2.9	1180	340	22
78	Gowi Kifa2	0	1.6	4.8	360	980	73
79	Gowi Raha2	12.2	35.3	3.4	440	1220	73
80	Unknown	19.1	23	2	480	770	62
81	Gowi Soyo Ungu	9	13.6	0.4	760	50	6
82	Gowi Baruze	4.3	34	1.6	530	80	13
83	Gowi Balaika	42.1	111.2	2.1	480	250	34
84	Unknown	2.1	4.8	2.1	900	620	41
85	Gowi Lahewa	0	0	2.1	300	460	61
86	Gowi Lagoji	2.9	8.4	0.4	930	40	4
87	Unknown	1	3	0	500	0	0
88	Gowi Sayolehe 1	0	0	0.6	360	80	18
89	Gowi Bunga 7	0	0	0.5	1240	30	2
90	Gowi Safusi 22	0	0	0.7	1720	120	7
91	Gowi Howa	0	0	2.9	820	620	43
92	Gowi Asua-sua	0	0	1.0	1900	60	3
93	Gowi Duma-duma	0	0	0	490	0	0
94	Gowi Skhato	8	9.7	2.4	450	600	57
95	Gowi Bala	0	0	0.4	540	70	11
96	Gowi Gumandru	2.3	11.1	1.5	320	110	26
97	Gowi Sinali 4	0	0	0.3	1760	35	2
98	Gowi Nharara	0	0	1.8	320	160	33
99	Gowi Adulo 5	6.6	15.5	1.9	640	450	41
100	Gowi Boro	3.8	3.7	0	830	0	0
101	Gowi Maofa 1	0	3.5	0.3	880	60	6
102	Gowi Ate 2	10.7	24.1	2.3	480	600	56
103	Gowi Raha 4	12.7	21	1.3	700	260	27
104	Gowi Sinali Ono	4.6	11.3	1.4	1060	45	4
105	Gowi Siadulo 3	0	5.6	2.2	450	310	41
106	Gowi Doma	0	3.3	1.3	270	170	39
107	Uto	4.6	7.2	1.3	490	430	47
108	Gowi Raha	8.1	18.6	1.2	720	300	29
109	Oyonosi	6.2	13.2	1.5	730	300	29

Table 3. Capsules seed number and growth status of some sweetpotato germplasm planted at Pacet, 1996.

No	Accessions	Total capsule/plant	Total seed /plant	No of root /plant	Vine weight (g/plant)	Root weight (g/plant)	Harvest index (%)
1	Wapoga	4.5	7.3	1.4	170	170	50
2	Unknown	869.2	1391.9	3.6	2250	1500	40
3	Gowi Asua-sua	56.2	122.0	2.3	300	700	70
4	Lampeneng Malam	44.3	95.9	1.6	450	450	50
5	Keleneng 3	47.3	81.5	0.5	190	300	61
6	Unknown	5	10.6	2.6	130	500	79
7	Dapot	197.2	383.4	4.1	460	750	62
8	BIS 183(OP) SR	143.3	194.1	4.5	550	1600	74
9	Unknown	138.7	278.3	2.1	380	550	59
10	Unknown	2.4	4.0	2.1	130	500	79
11	Selat	20.1	38.2	2.1	1100	300	73
12	Pangalengan	5.4	8.0	1.9	200	500	71
13	Unknown	267.5	634.0	2.1	1600	500	24
14	Bekau Nenei	90.6	166.8	1.6	950	1800	67
15	Bekau Genenai	21.9	41.7	3.9	720	700	49
16	Telo Ketel	320.6	402.1	3.9	740	700	49
17	Unknown	83.8	174.2	2.8	250	500	67
18	Mantang Mera	8.3	13.1	2.3	200	500	71
19	Unknown	115.9	207.3	1.0	180	200	53
20	Unknown	165.3	284.3	3.9	860	900	51
21	Unknown	78.6	166.7	3.0	190	400	68
22	Gowi Sinali 5	58.3	102.5	2.1	500	1200	71
23	Gowi Safusi 3	51.4	88.3	3.2	800	1500	65
24	Unknown	113.1	230.9	3.6	950	1600	63
25	Unknown	12.8	19.8	2.1	130	400	76
26	Unknown	17.9	31.7	2.3	260	600	70
27	Gowi Kifa 2	22.1	320	2.8	200	400	67
28	Unknown	40.2	89.9	3.1	150	500	77
29	Unknown	104.1	320.3	2.6	200	400	67
30	Gowi Soyo	107.4	165.6	2.9	250	700	74
31	Biru	7.8	9.3	3.6	200	700	78
32	Monthol	295.9	498.8	0.8	620	50	8
33	Anjung	338.9	554.8	3.9	230	1200	34
34	Bulhok 1	111.6	161.9	4.6	900	1100	55
35	Gowi Banio	27	34.0	3.6	900	1500	63
36	Kapas 2	33.8	65.1	3.2	300	800	73
37	Unknown	165.9	247.5	2.3	260	800	76
38	Unknown	0	0	0	0	0	0
39	N102030 V305	42	54.2	7.5	300	1500	83
40	Prambanan 48	74.8	112.2	3.3	250	600	71
41	Bekau Arfokngol	52.2	121.9	2.6	950	700	42
42	Gowi Doma	7.3	12.0	4.5	150	600	80
43	Gowi Raha	280.1	374.7	2.2	750	1650	69
44	Unknown	95.5	168.3	1.2	200	300	60
45	BIS 175	416.3	790.8	2.4	500	1000	67
46	BIS 183	68.3	122.8	1.6	150	500	77
47	Unknown	196.9	333.2	1.2	200	650	77
48	Sanggabuana	102.8	150.8	2.5	600	500	46
49	Gowi Bunga 7	85.6	121.8	3.8	200	1000	83
50	Gowi Duma-duma	94.5	119.8	2.6	270	1200	82
51	Unknown	33.8	54.8	3.3	200	900	82
52	Unknown	4.8	7.9	6.5	200	700	78
53	Unknown	349.5	728.6	3.7	700	1500	68
54	Unknown	312.9	623.4	6.5	800	1100	58
55	Unknown	6.7	11.0	3.0	130	450	78

Table 3. Continued.

No	Accessions	Total capsule/plant	Total seed /plant	No of root /plant	Vine weight (g/plant)	Root weight (g/plant)	Harvest index (%)
56	SQ 27	22.0	36.3	3.2	150	600	80
57	Trico	183.5	302.9	3.3	450	900	67
58	Unknown	46.1	79.0	5.9	900	2300	72
59	Gowi Lada	127.3	211.4	4.4	700	1400	67
60	Unknown	239.5	354.6	3.3	350	750	68
61	Gowi Lada 4	133.6	196.2	3.3	400	1000	71
62	Maluthuk	19.7	32.5	1.9	1200	500	29
63	Unknown	212.2	305.5	7.4	900	1500	63
64	Manar1	6.1	10.1	3.2	200	450	69
65	Unknown	159.5	205.1	5.2	950	2000	68
66	Unknown	30.4	45.6	3.3	180	700	82
67	Gowi Dohene 2	37.8	58.2	1.2	80	300	79
68	Gowi Sia Ali	11.0	18.2	1.2	300	500	63
69	Penet	93.0	157.0	2.9	200	450	69
70	Ceprok	60.3	130.7	1.7	200	1000	83
71	Unknown	343.5	567.1	1.7	1200	700	37
72	Sarangan	269.9	445.6	2.1	150	400	73
73	Unknown	8.1	13.3	2.5	50	300	86
74	Keleneng 2	72.8	120.2	1.5	250	700	74

Productivity

The average number of root, root weight, and harvest index of sweetpotato accessions cultivated at Pacet were higher than that of Cikeumeuh (Tables 2 and 3). While average of top weight at Pacet was lower than that of Cikeumeuh. Higher yield of the accessions cultivated at Pacet was mainly due to the long period of tuberization and genetic factors. It was stated before that all accessions cultivated at Pacet was classified as high dry matter, while the accessions cultivated at Cikeumeuh were classified as a scab tolerance.

At Cikeumeuh, 18 sweetpotato accessions were not able to produce root, accordingly, the average root weight was also low. While at Pacet almost all accessions cultivated were able to produce root, except B0484 was die. While at Pacet about 21 accessions were able produced more than 1 kg/plant or 40 t/ha, while at Cikeumeuh, only two accessions were able produce more than 1 kg/plant.

The maximum number of seeds obtained at Cikeumeuh were 401 seeds, while at Pacet were 1392 seeds and it was significantly higher than that of Cikeumeuh.

CONCLUSION

The flowering date and flowering peak season of sweetpotato accessions cultivated in Cikeumeuh were earlier than that of Pacet. The flowering period of sweetpotato in Pacet was longer than that of Cikeumeuh. The number of capsule and seed produced at Pacet was significantly higher than that of Cikeumeuh.

In Cikeumeuh, it was considered that about 9% of accessions were able produced more than 100 seeds per plants, and about 29% was failed to produce flower and seed. While at Pacet, the number accessions were able to produce more than 100 seeds even higher up to 59%, with only 1% was failed to produce flower and seed. The maximum number of seed obtained at Pacet was higher than that of Cikeumeuh, 1392 and 401 seeds, respectively.

The average of top weight of the accessions at Pacet were lower than those of at Cikeumeuh. On the contrary, the average of root number, root weight, and harvest index of sweetpotato accessions cultivated at Pacet were higher than at Cikeumeuh.

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