

Result of Vanilla (*Vanilla Planifolia*) Adaptation Study in Ethiopia

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Abstract: *Vanilla (Vanilla planifolia) is the only genus of the Orchidaceae family whose species produces a commercially important flavoring material. The study was conducted to evaluate the adaptability of introduced vanilla genotype in Ethiopia. A single observation plot was established in three locations. Vanilla was found adaptable in all location with comparable yield and quality. And results one variety with the name "Yeki 1" were registered for production.*

Keyword: *vanilla, adaptation.*

1. INTRODUCTION

Vanilla (Vanilla planifolia) is the only genus of the Orchidaceae family whose species produces a commercially important flavoring material (Severine Bory et al., 2008). Out of 110 known species of *Vanilla* only *Vanilla tahitensis*, *Vanilla pompoa* and *Vanilla planifolia* Andrews are commercially cultivated today (Ranadive, 1994). In Ethiopia 178 species in 38 genera of Orchidaceae have been documented in field guide to Ethiopian orchids by Sebsebe Demissew *et al* (2004), from them two of which are vanilla origin *V. Imperialis* and *V.roschei rchb.f.* but, the cultivated vanilla *Vanilla planifolia* has been introduced in to Ethiopia from Indonesia Bali island in 1993 and subsequent work have been done to see its adaptability at different locations of Ethiopia

Vanilla is mainly responsible for the fragrance, flavor and aroma of vanilla essence and the second-most expensive spice (after saffron). It is used in the preparation of ice cream, chocolates, cakes, pastries, puddings, soft drinks, pharmaceuticals, liquors, and perfumery and in nutraceuticals (Ranadive, 1994).

World production of cured vanilla beans averages between 2,000 and 3,000 Mts. per year, Madagascar is the largest producer, with 1,000 to 1,500 Mts, followed by Indonesia, with 700 to 800 Mts. and Comoro, with average production of 200 Mts. per year (). Although vanilla products are traded globally, the United States, France, and Germany are the primary importers of vanilla beans. They are major re-exporters of both processed vanilla extract and repackaged fresh beans to other countries (ADC, 2000).

His study was conducted based on the objective of evaluation of vanilla fragrance adaptability in south west Ethiopia for registering and promoting for production.

2. MATERIALS AND METHODS

2.1. Description of the Study Area

Table1. Summary of agro ecological description of the testing locations

Description	Tepi	Bebeka	Shosha
Average annual Temperature (°C)	15.3 - 29.5	15.1 - 27	29.5-15.3
Average annual Rainfall (mm)	1688	400 - 2000	1688
Altitude (m.a.s.l)	1200	500 - 1200	1200
Longitude	35°0' E	34.88-36.14	35°0' E
Latitude	7°3' N	7.21-5.33	7°3' N

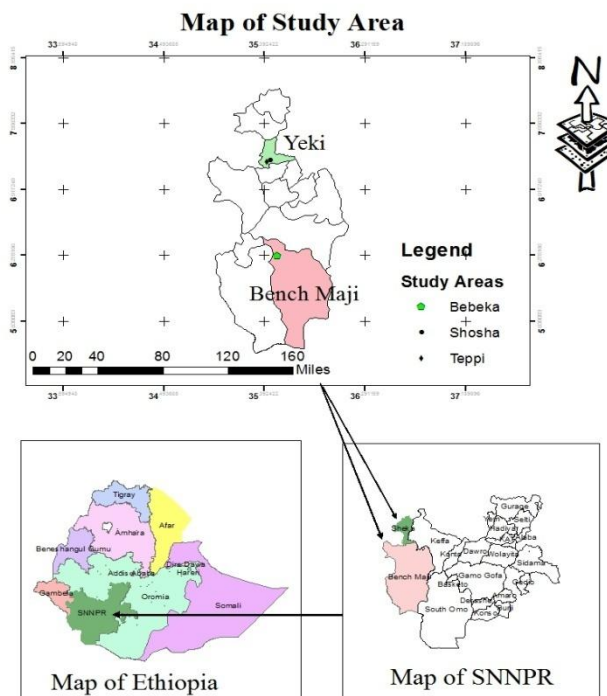


Fig1. Map of the study area

2.2. Experimental Design and Data Collection

The activity was conducted in south west Ethiopia SNNP regions in two zones Sheka and Bench Maji in a total of three locations. The description of the testing location is summarized in table 1. One variety of vanilla introduced from Indonesia Bali Island was evaluated for its adaptability, yield and quality using single observation plot. A spacing of 2m was maintained between rows and plants. Three months old Seedlings were transplanted to the field and a total of 100 plants were planted in each area. Data were collected on: vine girth and number of inflorescence per vine, number of flowers per inflorescence, number of pods per inflorescence, number of pods per plant, length of pod, pod yield and finally quality (vanillin content).

3. RESULT AND DISCUSSIONS

3.1. Propagation of Vanilla through Nodal Cutting and Tissue Culture

The study conducted to determine vanilla node number cuttings on nursery performance and mass propagation and protocol development results four node vanilla (*V. fragrans*) cutting were found best for raising seedling from nodal cutting (Girma et al. 2012) and . Study on mass propagation of vanilla plant by tissue culture at Jimma results efficient and reproducible tissue culture based mass propagation protocol for elite vanilla clones developed. An average number of 3.12 to 4.17 shoots were obtained after 45 days of nodal culture on MS media supplemented with BA combined with KIN and NAA (Zerihun Abebe et al., 2009).

3.2. Field Establishment and Planting

Three months old vanilla seedling raised in Tepi National Spices Research Center was planted in three locations during 2006 planting season. Vanilla is having climbing vines. Like all climbing plants, it needs support to grow to reach its full height. The advantage of shade and support is that it is provided with shelter from excessive exposure to the sun and strong winds. So far we do use gravelia as a shade tree and use bamboo as artificial support, but it is difficult to practice and require high cost. So, we introduce to the area the recommended support and shade tree *Gliricidia sepium* which is a legume contribute nitrogen to the soil, easily to propagate, fast growing and have deep roots so that nutrition in the upper soil layers, where the vanilla takes root, is not depleted.

During planting seedlings are set close to a previously planted climbing tree (the so-called 'tutor'). The vine is not allowed to climb freely up the tutor tree, but is regularly guided back to the ground to

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promote the growth of new roots in the soil. This method provides an ample supply of nutrients and triggers fast vegetative growth. Approximately two to three years after the vanilla vine was first planted, its head is pruned together with other parts of the plant, which in turn triggers physiological stress and induces flowering. The plant starts producing fruit after three to four years and is usually exhausted after eleven years at Tepi condition.

Table.2. *Survival rate*

Location	Initial number of plants	Number of plant survived and give yield	Percent survival
Tepi	100	98	98
Bebeka	100	80	80
Shosha	100	93	93

3.3. Result of Selection and Preparation of Support Tree

Vanilla is originally a forest plant and it therefore requires a similar forest environment. It must have a support tree to support its stem and to provide about 50% shade for good growth. However, the need to continually prune these trees to provide the optimum shade makes it necessary to select the best support tree, which are quick growing, easily propagated, provide light, chequered shade and have sufficient low branches over which the vines can be trained to hang down, with a type of growth providing easy access to the vanilla, and be easily pruned when necessary.

Table3. *Available support and shade tree in Ethiopia*

Scientific name	Common name/Amharic	Method of propagation	Suitability
<i>Gliricidia sepium</i>	Yeelka zaf	By seed and cutting	Best
<i>Erythrina orientalis</i>	korch	By seed and cutting	Best
<i>Jatropha carcas</i>	Kobo	By seed and cutting	Medium
<i>Casuarina equisetifolia</i>	shewshawe	By Seed	Medium
Gravilieae	Gravelia		Medium

3.4. Flowering and Pollination

Although vanilla flowers possess stigma and stamen (the flower's male and female reproductive organs), self-pollination is impossible because the two organs are separated by a thin membrane. In nature's own process, the blossoms are pollinated by certain melipona bees or hummingbirds which are to be found only in the native regions of the cultivated vanilla species (Mexico). Moreover, this process does not result in the systematic pollination of all blossoms of a flowering vanilla vine. To overcome this biological (and commercial) barrier, vanilla is pollinated by hand. This labor-intensive method has to be applied daily throughout the four-month blooming season, simply because the individual vanilla flower is open for less than 24 hours and is receptive to pollination only for a brief period of eight to twelve hours. In other country a good worker can pollinate up to 1500 flowers in one day, but in our experience one person can pollinate up to 100 flowers per hour. Vanilla flowers and the resulting pods grow on several panicles per plant. On each panicle only a limited number of well-developed beans are allowed to mature; this ensures good quality beans of the desired length (10-25cm). A single vanilla plant can produce up to 150 pods per harvesting period.

3.5. Maturity and Harvesting

The green vanilla beans eventually mature and are ready for picking when the color of their base turns from green to a yellowish hue – approximately seven to eight months after pollination. Harvesting the beans at this stage will provide the best flavor quality and vanillin content in the processed vanilla beans. If they are picked too early, the beans will have lower vanillin content and are more susceptible to mould during subsequent processing and storage. Beans picked too late develop well in flavor and vanillin but tend to burst at the base and are thus inferior in appearance, which has a detrimental effect on their sale price.

Table.4. *Response of vanilla fragrance for yield and yield related parameters in three location*

Parameters	Tepi Range	Shosha Range	Bebeka Range
Leaf Length (cm)	19.04-14.3	20.8-15.9	21.2-13.2
Leaf Width (cm)	4.66-3.7	5.8-4.6	6.2-2.8
Bean Length(cm)	14.85-11.88	15.96-12.46	17.55-12.8

Bean girth (cm)	1.88-0.63	0.98-0.66	3.65-2.8
Bean fresh Weight (gram)	10.27-6.01	16.4-9.7	15.3-10.4
Bean dry Weight (gram)	2.57-1.29	2.57	1.29
Inter nod length (cm)	11.7-8.9	14.3-11.1	18.2-10
Vanillin content (%)	1.7-2.5	1.8-2.56	1.6-2.49
Flowering day	January to march	January to march	January to march
Days flowering to fruit maturity	9-8months	9-8months	9-8months
No. flower/inflorescence	20.6-10.8	20.6-10.8	20.6-10.8
No. of inflorescence/vine	18-8	18-8	18-8
No. of bean /inflorescence	15.3-12.6	11.6-3.6	15.3-12.6
Yield of green bean vanilla/tree(gm)	455.04	455.04	455.04
Yield of curried bean vanilla/tree (gm)	81.29	81.29	81.29
Flower bundle length	6-8	4.5-7.9	4-7.7

Vanilla is a perennial vine and it remains in commercial production for 5 to 6 years if well-managed. A mature plant of 3 to 4 years can produce 80-100 beans per year (). A pure stand of vanilla can produce yields of up to 2,700 - 3,000 kg per hectare of green beans which translates to 500 to 600 kilograms of cured beans() where as from the adaptation trial in Ethiopia mean yield of curried been per hectare 204 kilogram were found.

Table 5. Processing of vanilla and required time

No.	Activities/phases	Required time
1	Harvest	Day 1
2	Sorting & grading	Day 1
3	Water or sun killing	Day 1
4	In-Box starting	Day 1 to day 3 48 hours
5	Sun curing and in-box sweating	Day 3 to day 18, 15 days
6	In-shed curing	Day 18 to day 90, 60 days
7	Sorting and bundling	Day 90
8	In-box conditioning	Day 90 to day 120, 30 days

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