**Penilaian kandungan 2 –Acetyl-1-pyrroline (2-AP) di dalam beras wangi pada suhu pengeringan dan darjah pengilangan berbeza**

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**ABSTRAK**

Kesan suhu pengeringan padi dan darjah pengilangan yang berbeza ke atas aroma beras wangi iaitu 2-Acetyl-1-pyrroline (2-AP) telah dikaji. Didapati kandungan 2-AP lebih tinggi apabila padi dikeringkan pada suhu 45°C, berbanding pada suhu 40°C dan 50°C dengan menggunakan fiber Solid Phase-Micro Extraction (SPME) dan kromatografi gas-spektrometer jisim (GC-MS). Selain itu, beras dengan darjah pengilangan yang tinggi iaitu melebihi 60% menunjukkan kandungan 2-AP yang lebih tinggi berbanding pada darjah pengilangan 30% dan lebih rendah.

***ABSTRACT***

*The effect of drying temperature and degree of milling on 2-Acetyl-1-pyrroline (2-AP) was investigated. The 2-AP was found higher when paddy dried at 45°C, compared to 40°C and 50°C using Solid Phase-Micro Extraction (SPME) fiber and gas chromatography-mass spectrometry. Besides, aromatic rice at higher milling degree, which is 60% and above showed better 2-AP content, compared to lower milling degree (30%).*

**PENGENALAN**

Tren semasa menunjukkan pengguna mula memilih beras berkualiti tinggi, samada untuk kesihatan; tinggi kandungan vitamin seperti beras ‘parboiled’ dan mempunyai aktiviti antioksidan seperti beras perang ataupun yang beraroma. Beras wangi semakin popular dan mendapat tempat di dalam pasaran tempatan, mahupun antarabangsa. Oleh kerana sifatnya yang berbau wangi dan mempunyai rasa lebih sedap berbanding beras biasa, permintaan ke atasnya adalah tinggi dan mereka juga sanggup membayarnya dengan harga yang lebih tinggi.

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**METODOLOGI**

1. Sampel

Sampel padi adalah beras wangi MRQ 76 daripada plot penyelidikan padi, MARDI Seberang Perai, Pulau Pinang.

1. Pengeringan

Sampel padi wangi dengan xxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.

1. Darjah Pengilangan

Padi yang dikeringkan xxxxx xxxxxx xxxxxx xxxxxxx xxxxx xxxxxxx xxxxxxx xxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.

1. Penentuan kandungan 2-AP

Kesan suhu xxxxxxx xxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.

**HASIL DAN PERBINCANGAN**

1. Pengeringan dan darjah pengilangan

Pengeringan pada suhu xxxxxx xxxxxxxx xxxxxxx xxxxxx xxxxxxx xxxxxxxx xxxxxxxxxx xxxxxxxx xxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxx xxxxxxxx xxxx xxxxx xxxxx xxxxxxxxxxx xxxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxx xxxxxx xxxxxxx xxxxxxxxx xxxxxxxx xxxx xxxxxx xxxxx xxxxx xxx xxx xxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxx xxxxxxxx xxxxxxx xxxxxxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxx xxxxxx xxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxx xxxxxxxx xxxxxxxxx xxxxxxxxxxx xxxxxx xxxxx xxxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxxxxxxxxxx xxxxxxxxxx xxxxxxxxxxxxx xxxxxxxxx xxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxx (Jittanit et. al, 2010).

Melalui xxxxxx xxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxx xxxxxxx xxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxxxxxxxxx xxxxxxxxxxxxx xxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxx xxxxxxxxxxx xxxxxxxxxxxxxxx direkodkan sebagaimana *Jadual 2*. Xxxxxxxxxxxxxxx xxxxxxxxx xxxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxx xxxxxxxxxxxxxx xxxxxx xxxxxxxxxxxxx xxxxxxxxxx.

1. Kandungan 2-Acetyl-1-pyrroline (2-AP)

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**KESIMPULAN**

Suhu pengeringan dan darjah pengilangan yang betul amat penting dalam proses pengilangan padi. Keseimbangan antara kos operasi, kehilangan bau wangi dan dapatan beras hancur adalah bergantung kepada suhu pengeringan dan darjah pengilangan yang betul. Suhu pengeringan yang rendah diantara 40 - 45°C didapati dapat mengekalkan kandungan sebatian 2-AP dan mengurangkan peratus beras hancur, namun begitu suhu ini dijangka akan meningkatkan kos operasi kerana padi mengambil masa yang lebih lama untuk kering. Oleh itu, penggunaan alat pengering yang dapat menjimatkan tenaga perlu dikaji dari masa ke semasa dalam memastikan kos operasi dan pengilangan beras dapat diminimakan.

**RUJUKAN:**

Buttery RG, Ling LC. (1982) . 2-Acetyl-1-pyrroline: an important aroma component

of cooked rice. Chem Ind (Lond) 1982:958–9.

Ishitani K, Fushimi C. (1994). Influence of pre- and post- harvest conditions on 2-

acetyl-1-pyrroline concentration in aromatic rice. The Koryo 183:73–80.

Lalita Payakapol, Anuchita Moongngarm, Natcha Daomukda, Angkana Noisuwan

(2010) .Influence of Degree of Milling on Chemical Compositions and Physicochemical Properties of Jasmine Rice. 2010 International Conference on Biology, Environment and Chemistry. IPCBEE vol.1 (2011) © (2011) IACSIT Press, Singapore. 83 – 86.

Mary Ann U. Baradi, Arnold R. Elepaño (2012). Aroma Loss in Rice as Affected by

Various Conditions during Postharvest Operations. The Philippine Agricultural Scientist, Vol 95: No 3

Weerachet Jittanit\*, Natthiga Saeteaw, Apinya Charoenchaisri (2010). Industrial

paddy drying and energy saving options. Journal of Stored Products Research 46:209-213

Yoshihashi T. (2002). Quantitative analysis of 2-acetyl-1-pyrroline of an aromatic

rice by stable isotope dilution method and model studies on its formation duringcooking. J Food Sci 67(2):619–22.

Yoshihashi, T. Nguyen Thi Thu Huong, Vipa Surojanametakul, Patcharee

Tungtrakul, And Warunee Varanyanond (2004). Effect of Storage Conditions on 2-Acetyl-1-pyrroline Content in Aromatic Rice Variety, Khao Dawk Mali 105. Sensory & Nutritive Qualities. 1-4.

Jadual 2: Analisa fizikal pada darjah pengilangan berbeza

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| --- | --- | --- | --- |
|  | **Pulangan****Pemutihan (%)** | **Beras hancur** **(%)** | **Keputihan** |
| **Darjah Pengilangan (%)** |  |  |  |
| **30** | 73.42a | 19.44c | 22.89c |
| **70** | 70.227b | 26.52b | 27.00b |
| **100** | 64.44c | 33.16a | 41.39a |

Graf 1: Kandungan 2-AP pada suhu pengeringan berbeza