The Effects of Five Different Types of Planting Medium on the Growth Performance of Chilli

Fazidah Rosli
Khairul Ikmal Muhammad
Md Jamaluddin Bula
Noorshilawati Abdul Aziz
Nur Suraya Abdullah
Anisah Mohammed
Mohamad Amir Shah Yusop
Mohammad Ridhwan Nordin

ABSTRACT

The demand for chilli has increased tremendously in recent years. Chilli is a popular vegetable valued around the world for the color, flavor, spice, and nutritional value it contributes to many meals. Recently, the adverse effects of modern agriculture and the cause of several problems in environment have become a serious topic discussed. The objectives of this study is to evaluate the growth performance response of Capsicum annuum in five (5) different types of planting medium, and to determine the most suitable planting medium for the growth of chilli. The five (5) planting médium used were the Soil Mixture, Cocoa Peat, Organic Compost, burned Paddy Husk and also Empty Fruit Bunch. The experiment was conducted at Taman Herba, Unit Pengurusan Ladang, UiTM Pahang from Julai to October 2012 (13 weeks). The variety of Kulai (Line 15) and MC 11 were used in this experiment. A Randomized Completely Block Design (RCBD) with five (5) treatments and four (4) replications have been employed in this experiment. The data collected are plant height, number of leaves, fresh weight and dry weight of chilli. All the data was analyzed using the Microsoft Excel and Statistical Package for Social Science (SPSS). The result showed that the best treatment was obtained when using Soil Mixture and Cocoa Peat which gave good effect on the growth performance of chilli. But unfortunately, the result showed that Empty Fruit Bunch is not recommended to be used as planting medium for chilli plant because it does not show good performance for chilli growth.

Keywords: *chilli, planting medium, growth performance*

Introduction

Chili is a popular vegetable valued around the world for the color, flavor, spice, and nutritional value contributes too many meals. Chili is also an important commercial crop, cultivated for vegetable, spice, and value-added processed products. In many regions where chilli is widely consumed, they added chilli to the diet to provide flavor, spice, and variety to grain or root-crop-based diets. Their consumption represents a major source of vitamins and minerals in certain regions. Processed chillis are found in a variety of products including main dishes, meats, snack foods, hot sauces and others. The extracts of chilli are also used in pharmaceuticals, as medicinal, and in cosmetic products (Valenzuela, 2011).

Planting Medium

Jacobs et al., (2009) stated that, selecting the proper growing medium is one of the most important considerations in nursery plant production. A growing medium can be defined as a substance through which roots grow and extract water and nutrients. In native plant nurseries, a growing medium can consist of native soil but is more commonly an "artificial soil" composed of materials such as peat moss or compost.

Soil Mixture

The normal soil mixture ratio is 3:2:1 that contains 3 part of soil, 1 part of organic matter and 1 part of sand. This soil mixture use as planting medium because that easy to get and low cost. Soil can give the good physical for the chilli growth. Soils also have a good soil properties and water holding capacity. Sand must be mix with the soil for well drain in the planting medium. The ideal pH range of soil is 6.0 to 6.5. Other than that, soil can be the good growth support for the chili plant and in the soil already contain the natural nutrient that require of chili plant. Other than that, chilli plant can easily infected with root disease and virus that caused by soil (Ni, 2011).

Cocoa Peat

Yahya et al., (2009) stated that cocoa peat is an agricultural by-product obtained after the extraction of fiber from the coconut husk. As a growing medium, cocoa peat can be used to produce a number of crop species with acceptable quality in the tropics. Cocoa peat is considered as a good growing media component with acceptable pH, electrical conductivity and other chemical attributes.

Compost

Compost is the product produced by aerobic decomposition of biodegradable organic matter. Compost products can be used as a high quality and hygienically safe fertilizer. Mature compost is a brown-black crumbly material with an earthly smell. If applied to the soil, microorganisms continue to degrade the compost through the process of mineralization (Joseph and John, 2009).

Burned Paddy Husk

Paddy husk are skin of paddy seeds (*Oryza sativa*) that has been blended. The popular used of paddy husk which are charcoal and raw bran. Rice husk is the outer layer of rice grain which is removed during rice processing. It composes of mainly organ cellulose material. It is reported that rice husk contains 34 to 44% of cellulose, 23 to 30% of lignin, 13 to 39% of ash and 8 to 15% of moisture (Siti and Yusof, 2003).

EFB (Empty Fruit Bunch)

In terms of fertilizer use, one tonne of EFB is equivalent to 7 kg of urea, 2.8 kg of rock phosphate, 19.3 kg of muriate of potash, and 4.4 kg of kieserite EFB is also a source of organic matter which increases soil aggregation, aggregate stability, and water infiltration, and hence, it reduces soil erosion. Nevertheless, one well-known disadvantage of EFB is that it is rather bulky. One recent method used is to compress the EFB into a mat or carpet known as Ecomat. In this research result show EFB has a lower bulk density, higher saturated hydraulic conductivity and high water content. In addition, EFB is a good water holding capacity and these properties helped the soil treated with EFB (Christopher et al., 2010).

Methodology

This experiment was conducted under open area at Taman Herba, Unit Pengurusan Ladang UiTM Jengka, Pahang from Julai – Oktober 2012 (13 weeks). The five (5) types of planting medium used in this experiment were Soil mixture (3:2:1), Cocoa peat, Compost, Burned paddy husk, and raw Empty Fruit Bunch (Figure 1). Two varieties of chilli used in this experiment were Kulai (Line 15) and MC 11. Chilli seed for both varieties were sown into seed germination tray (for 6 weeks) and chilli seed were transplanted into polybags for another 7 weeks. The size of polybag used for transplanting 15 inches x 18 inches. The chilli plants were supplied with manual water of 500ml water for the first and second week after planting. For the consequence week, 1000ml of water supplied twice per day to each chilli plant until end of the experiment. Besides watering, chilli plant was applied with NPK 15:15:15 fortnightly (every two week).

The experiment consist of 40 plots with two (2) treatment factors which is Kulai (Line 15) and MARDI MC 11 and the five (5) different type of planting medium and four (4) replications by using Randomized Completely Block Design (RCBD). The experimental layout as showed in Table 1. The data collection was done on weekly for the plant height and number of leaves. At the end of the experiment, the

whole plant will be harvested (40 plants) to determine its fresh weight and dry weight. All data collected analyzed by Statistical Package for Social Science (SPSS) and Microsoft Excel.

Figure 1: The five (5) different types of planting medium

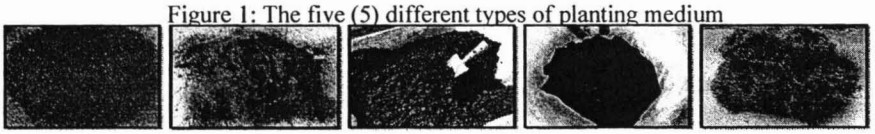


Table 1: The Experimental Layout (RCBD)

Replication 1	Replication 2	Replication3	Replication 4
V1M1	V1M3	V1M4	V2M1
V1M2	V1M1	V1M2	V1M5
V1M4	V1M5	V2M4	V1M2
V1M3	V2M3	V1M1	V1M3
V2M2	V1M2	V2M1	V2M3
V1M5	V2M1	V2M2	V1M1
V2M1	V2M2	V2M3	V2M4
V2M5	V1M4	V1M3	V2M5
V2M3	V2M4	V1M5	V2M2
V2M4	V2M5	V2M5	V1M4

V1 - Chilli seeds variety Kulai (Line 15)
V2 - Chilli seeds variety MC 11
M1 – Soil Mixture
M2 – Cocoa Peat
M3 – Organic Compost
M4 – Burned Paddy Husk
M5 – Empty Fruit Bunch

Results and Discussions

Figure 2 showed the changes in mean of plant height for chilli plant over time. The growths of plants were increased significantly for the 3 weeks after planting. However, variety Kulai (Line 15) that planted using burned paddy husk was increasing drastically for the fifth (5) week after planting. The chilli planted in the soil mixture (V1M1) showed the highest performance (48.20 cm) among others until the seventh week. However, Empty Fruit Bunch (V1M5) showed the lowest performance (19.28cm) among the other treatment.

Figure 3 showed the changes in mean of plant height for Chilli plant variety MC11 over planting. The growths of plants were increased significantly for the 3 weeks after planting. However, chilli plant using Soil Mixture (V2M1) started to increase very steepest on the fifth week until the last week (50.48 cm), but the chilli plant using Empty Fruit Bunch (V2M5) showed lowest performance (20.53cm).

The ANOVA test showed that both varieties (Kulai (Line 15) and MC11) gave a significant effect (0.015 and 0.000 simultaneously) to the growth of plant height. Therefore, the null hypothesis at significant level of 0.05 had to be rejected. According to Department of Agriculture Malaysia (2007) stated that the plant height of chilli that planted on the soil bed mixture can grow 70cm until 80cm for variety Kulai (Line 15) and 80cm until 110cm for variety MC 11.

Figure 2: Mean of plant Height (cm) for Variety Kulai (Line 15)

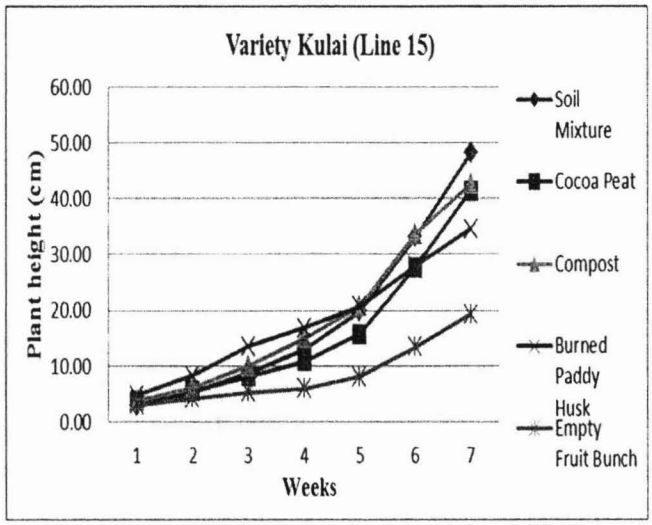


Figure 3: Mean of plant height (cm) for Variety MC 11

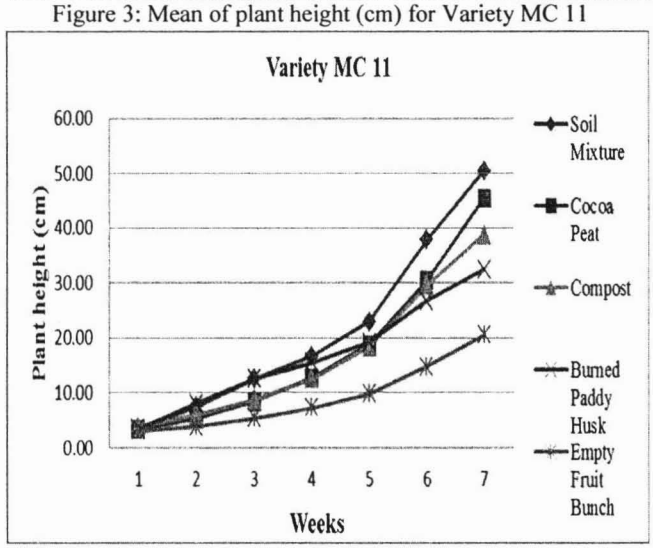


Figure 4 showed that changes in mean number of leaves for chilli plant over planting period. The growth of plants was increased slightly for the first two weeks after planting. However, the steepest increased in number of leaves for planted using Cocoa Peat, Soil Mixture (V1M1) showed the highest rate (40 leaves) on the seventh weeks. On the other hand, these both varieties planted using Empty Fruit Bunch (VIM5) showed the lowest number of leaves (15 leaves) within the period of planting.

Figure 5 showed the changes in mean number of leaves for variety MC11 over time. Chilli plant using the medium of Soil Mixture (V2M1) and Cocoa Peat (V2M3) showed the highest mean number of leaves (54 leaves and 55 leaves) simultaneously. Meanwhile, planting media Empty Fruit Bunch (V2M5) still the lowest mean number of leaves (17 leaves) within the period of planting.

ANOVA test for both varieties showed that planting medium have significant effect (0.044 and 0.002 simultaneously) on number of leaves for both varieties. This means that the null hypothesis at significant level of 0.05 had to be rejected.

Figure 4: Mean Number of Leaves for Variety Kulai (Line 15)

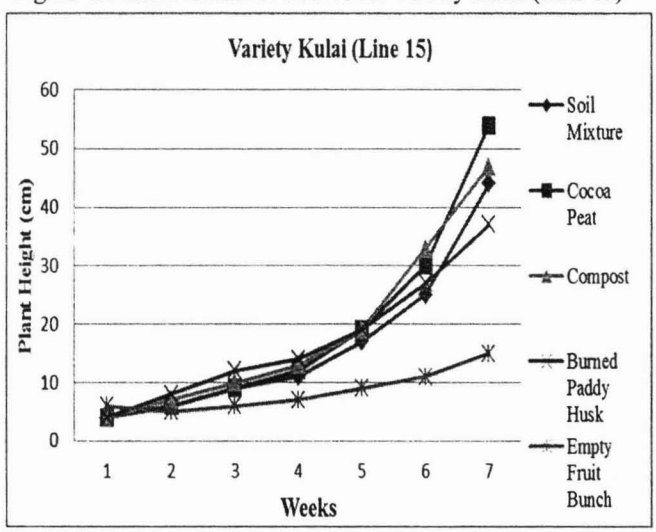


Figure 5: Mean Number of Leaves for Variety MC 11

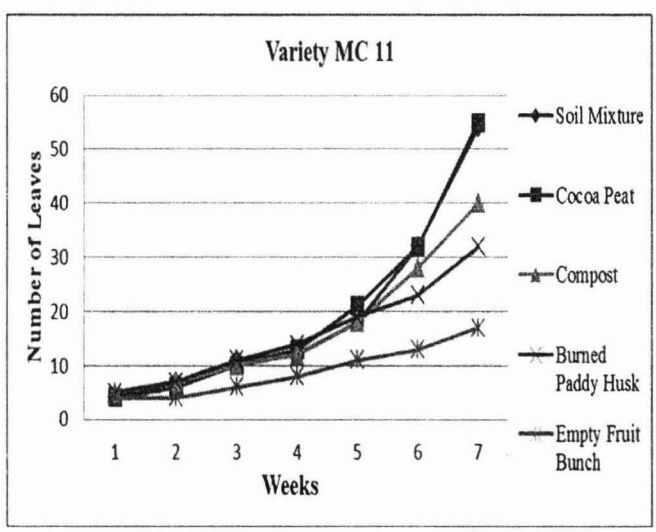


Figure 6 showed variety Kulai (Line 15) grown using Burned Paddy Husk had no significant different with Soil Mixture, Cocoa Peat, Compost and Empty Fruit Bunch. However, the highest fresh weight (49.4 g) gave by Compost (VIM3) compared to Empty Fruit Bunch (V1M5) which gave the lowest value (7.08 g) of fresh weight.

Figure 7 showed Cocoa Peat (V2M2) showed the highest value (62.15 g) of fresh weight, while Empty Fruit Bunch (V2M5) gave the lowest value (9.08 g) of fresh weight.

ANOVA test for both varieties indicates that the significant values of fresh weight for variety Kulai (Line 15) and MC 11 is 0.022 and 0.000 which below than level of 0.05, thus the hypothesis is failed to reject for both varieties. According to the study by Suharja, (2009), fertilizer and medium of planting can affect the biomass, chlorophyll content and nitrogen content of the leaf.

Figure 6: Chart of Mean Fresh Weight (g) for Variety Kulai (Line 15)

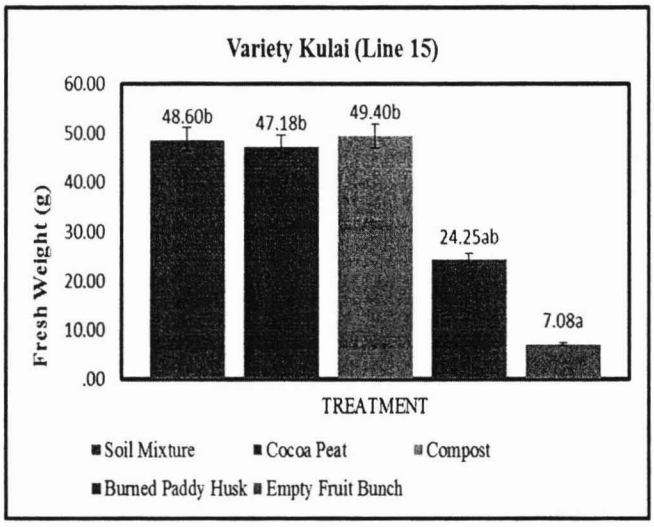


Figure 7: Chart of Mean Fresh Weight (g) for MC 11

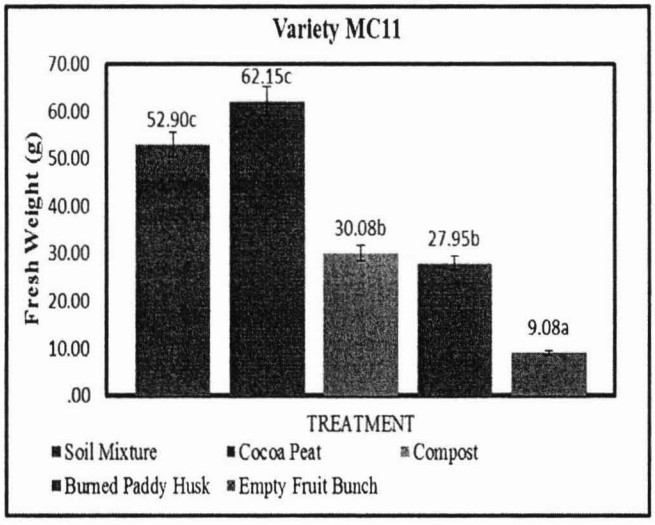


Figure 8 showed Cocoa Peat (V2M2) gave the highest value (8.55g) of mean dry weight followed by Soil Mixture (V2M1) with value 7.85g. The lowest value (1.20 g) was given by Empty Fruit Bunch (V2M5)

The ANOVA test indicated that different types of planting medium for both varieties (Figure 8 and figure 9) have significant effect (0.012 and 0.000) on dry weight of plant. This means that null hypothesis at significant level of 0.05 had to be rejected. According to Baharuddin, (2005), the using of Cocoa Peat 100% as planting medium resulted in highest growth percentage of dry weight of leaves and stem (62.7% higher than the control), while the use of burned rice husk 50% + Cocoa Peat 50% resulted in the highest increase of total dry plant weight (46.8%) and number of leaves (37.1%).

Figure 8: Chart of Mean Dry Weight (g) for Variety Kulai (Line 15)

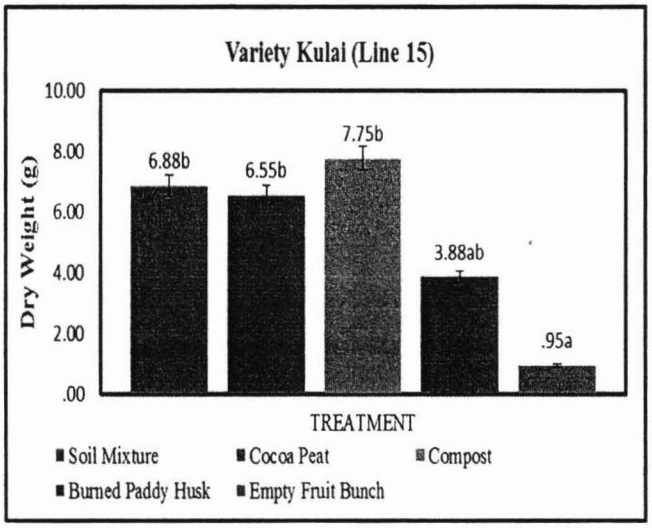
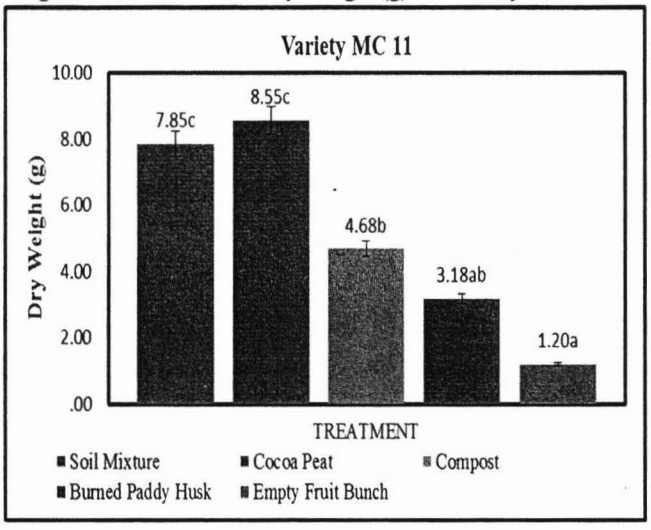


Figure 9: Chart of Mean Dry Weight (g) for Variety MC11



Conclusion and Recommendation

Based on this research project, it can be concluded that there are three planting medium that suitable to be used for a successful plant growth. The three planting medium are, Soil Mixture, Cocoa Peat and Compost. However, based on the result showed, Burned Paddy Husk and Empty Fruit Bunch are not preferable to be used as the medium of planting for chilli.

There are advantages and disadvantages for these five types of planting medium. For Soil Mixture, it produces highest plant height of both varieties. While, Cocoa Peat showed better for number of leaves produced and both fresh and dry weight for MC11. Furthermore, Compost is the most preferable for both fresh and dry weight. Hence, it is recommended that all these three types of planting medium are suitable for the chilli plant growth.

As a recommendation for the future research, it is suggested to apply the suitable fertilizer or any organic fertilizer towards the planting medium to give them enough nutrients content that needed for the growth of chilli plant.

References

Baharuddin L., (2005). Pengaruh Media Penanaman Terhadap Hasil Tanaman Cili dalam Sistem Fertigasi (*Capsicum annuum* L.). *Manual Program Teknologi Tumbuhan, Sekolah Sains dan Teknologi*, Universiti Malaysia Sabah.

Christopher, T. B. S., Goh, K. J., & Khairun N. K. (2010). Physical Changes to Oil Palm Empty Fruit Bunches (EFB) and EFB Mat (Ecomat) during Their Decomposition in the Field. *Journal of Trop. Agriculture*, 33(1), 39 to 44.

Department of Agriculture Malaysia, (2007). Pakej Teknologi Cili. Kementerian Pertanian dan Indusri Asas Tani, Malaysia.

Jacobs, Douglass F, Landis,Thomas D., Luna, Tara., (2009). *Nursery manual for native plants: A guide for tribal nurseries*- Volume 1: Nursery management.Agriculture Handbook 730. Washington, D.C.: U.S. Department of Agriculture, Forest Service, 77-93.

Joseph C. P. & John L. B., (2009). *COMPOSTING*: Processing, Materials and Approaches. New York: Nova Science Publishers, Inc.

Ni L., P. I., Sri, H., & A. Soemargono (2011). The effect of planting medium on the growth of pineapple seedling. ARPN *Journal of Agricultural and Biological Science*. 6.

Siti, S. S. & Yusof A., (2003). Ground rice husk as filler in Rubber compounding. *Journal of Technology*. Universiti Teknologi Malaysia, 135-148.

Suharja, (2009). Biomass, Chlorophyll and nitrogen content of leaves of two chili pepper varieties (*Capsicum annuum* L.) in different fertilization treatments. *Journal of Nusantara Bioscience*. Vol. 1, No.1,Pp.9- 16.

Yahya, A., Anieza S. S., Rosli, M., & Ahmad, S., (2009). Chemical and physical characteristic of cocoa peat based media mixtures and their effects on the growth and development of *Celosia cristata. American Journal of Agricultural and Biological Science* 4 (1), 63-71.

Valenzuela, H. (2011). Farm and Forestry Production and Marketing Profile for Chili Pepper *(Capsicum annuum)*. Specialty Crops for Pacific Island Agroforestry. Permanent Agriculture Resource (PAR), Holualoa, Hawai'i.

FAZIDAH ROSLI, KHAIRUL IKMAL MUHAMMAD, MD JAMALUDDIN BULA, NUR SURAYA ABDULLAH, NOORSHILAWATI ABDUL AZIZ, ANISAH MOHAMMED, MOHAMAD AMIR SHAH YUSOP.
Universiti Teknologi MARA (Pahang).
fazidahrosli@pahang.uitm.edu.my,jamaluddinbula@pahang.uitm.edu.my, nsa@pahang.uitm.edu.my, noorshilawati@pahang.uitm.edu.my, anisahm@pahang.uitm.edu.my, amirshah@pahang.uitm.edu.my.

MOHAMMAD RIDHWAN NORDIN.
Kolej Komuniti Pekan, Pahang.
Ridhwan.nordin@hotmail.com.